ANNALS

OF

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A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE.

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ANNALS OF SURGERY.

ON THE VALUE OF COCAINIZATION OF THE NASAL MUCOUS MEMBRANE BEFORE AND DURING SURGICAL ANÆSTHESIA, WITH REPORT ON ONE HUNDRED CASES.

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FEW of those using ether exclusively as an anæsthetic know the fact that it was universally employed in Germany up to the year 1847, when the discovery of chloroform anæsthesia swept it out of surgery abroad. It is told us that Langenbeck, then in the zenith of his activity, expressed the general sentiment of continental surgeons by saying, "Thank God, we are rid of that confounded ether." And the reign of chloroform has lasted nearly forty-eight years. Based upon the extensive use of ether in the Eastern States of the North American Union, and stimulated by the growing favor extended to it in France, German surgeons are beginning to study the advantages and peculiarities of ether anæsthesia. To us who are habitually narcotizing with ether, the movement now progressing in favor of this substance in Germany presents a number of curious features.

It is not the object of this paper to dwell upon the aspect of this controversy, so familiar to us all on this side of the Atlantic, and I shall content myself with mentioning that in the German clinics where ether is given, its administration is guarded by a great deal more of caution and punctiliousness in the observance of the rules of anæsthesia than that of chloroform. The main factor in this phenomenon is undoubtedly due to the lack of familiarity, but there is present an element of distrust also, which naturally would stimulate the risibilities of any one accustomed to the fearless and energetic exhibition of ether by the average type of American hospital interne.

Another point worthy of mention is the wide divergence in estimating the statistical value of the figure of the death-rate caused by chloroform. According to Bardeleben the death-rate varies in the experience of different surgeons between the proportions of 1 : 2000 and 1 : 30,000. What is responsible for this remarkable difference? In one surgeon's hands one out of 2000 patients succumbs to the anæsthetic, while in another one's service there is only one death in 30,000. Are these variations dependent on the quality of the chemical used, or rather on the care bestowed on the technique of anæsthesia? Another statistical curiosity is presented to us by Poppert,[1] who shows, from data collected by himself, that death was caused by ether once in 1167 cases, while it happened once in 2647 cases of chloroform anæsthesia.

Here we have another example of the uncertainty and contradictoriness of statistical conclusions, caused mainly by the disregard of personal factors, the value of which is all the more keenly appreciated as their utilization is forbidden by common politeness and the love of peace.

It is gratifying to state that, in this country, with the diminution of the fanaticism which formerly obscured every discussion of the value of anæsthetics, an impartial and more scientific attitude of the surgical mind has learned to admit the usefulness of chloroform under certain contingencies. We observe to-day that

[1] Deutsche medicinische Wochenschrift, 1894, No. 8.

most of us are not wedded exclusively to any one anæsthetic, and that our choice is influenced more or less by certain indications, the value of which, however, is still to be established by experience and research.

It is likewise gratifying to see our European colleagues abandon the exclusive use of chloroform and acquire the skill of employing ether. Very probably neither one of these substances will become the exclusive anæsthetic, and an intelligent choice and adaptation of the proper anæsthetic to each individual case will remain the safest and most humane course to pursue.

With the knowledge that general anæsthesia induced for surgical purposes, and maintained for more than a few seconds by the aid of whatever substance, must be always fraught with some danger, the question will necessarily predominate, Which one of the phenomena of anæsthesia represents the most dangerous factor? This momentous question, once before decided for us by the Anglo-Indian Chloroform Commission, was approached from a new side by Paul Rosenberg,[1] whose experiments seem to confirm the view that the main factor in causing dangerous irregularity in the heart's action is an interference with the organs of respiration. By this is understood not only *mechanical* interference with the entrance and expulsion of air, but mainly the interference with the pneumogastric and respiratory nerve-centre in the medulla, caused by reflex irritation of the terminal branches of the trigeminal nerve distributed in the nasal mucous membrane.

To demonstrate the influence of this element upon the heart's action, Rosenberg has instituted a series of extremely interesting experiments on animals, the substance of which I shall endeavor to sketch.

A kymographion having been attached and adjusted, the pulse-curve was taken in the normal state of the animal. Then anæsthesia—with chloroform or ether—was induced by inhalation through the nose, when a most remarkable alteration of the pulse-curve was instantly observed, consisting in acceleration and loss

[1] Berliner klinische Wochenschrift, Nos. 1 and 2, 1895.

of energy indicated by extreme shallowing of the amplitude of excursion, in short, a phenomenon identical with what is observed as a consequence of irritation by faradic current of the pneumogastric nerve. As soon as the route of inhalation was changed from the nose to a tracheal cannula previously inserted, the pulse-curve returned, sometimes to the normal shape, but always to what was nearly normal. No difference of any account was observed whether chloroform or ether was employed. The experiment was varied by carrying on the narcosis through the cannula and observing the pulse-curve, then by spraying chloroform fumes upon the nasal mucous membrane, when immediately the same alteration of the curve was noted as when the animal was breathing through the normal channels.

A marked accentuation of the irregularities and depression of the heart's action invariably coincided with the time, when chloroform or ether was newly applied in the course of anæsthesia, and the intensity of the effect was directly proportionate with the quantity of the anæsthetic used at each application. The organism was found to be much more sensitive to the depressing effect of renewed doses of the narcotic at the beginning of anæsthesia, but the phenomenon, though less marked at the end of full narcosis, was still very perceptible throughout. By rigidly adhering to the so-called "drop method," according to which the anæsthetic is administered in an unbroken and even succession of single drops applied to the mask or cone, these recrudescences of the effects of the anæsthetic were reduced to their minimum.

From these facts, amply tested and retested on a number of animals, Rosenberg concluded that the disturbance manifested by the heart, whenever an anæsthetic came in contact with the nasal mucous membrane, is reflex, and must be transmitted to the respective centres in the medulla through the channels of the trigeminal nerve, whose terminal ramifications are exposed to the action of the anæsthetic. He argued that by eliminating the perceptive capacity of these ramifications by an application of cocaine, similar results could be obtained, as by anæsthesia

through a tracheal cannula. And the actual experiment proved the correctness of this assumption. Whenever the nasal mucous membrane was properly cocainized, the induction of anæsthesia by inhalation through the nose was not followed by disturbances of the rate of respiration and of the pulse-curve.

As a further consequence of these experiments, it may be stated that sudden death due to the inhalation of chloroform or ether is always caused primarily by an inhibition affecting the respiratory centre, the heart continuing to act, though in an enfeebled manner, for some time after the stoppage of respiration. As long as the heart's action is present, danger can be averted by the maintenance of artificial respiration with or without tracheotomy. In the course of the experiments upon which this report is based, we had an opportunity to verify these statements in the most striking manner.

According to Rosenberg, the advantages of the cocainization of the nasal mucous membrane preceding and during anæsthesia are,—

(1) As the patient's perception of the odor of the anæsthetic is much diminished, the feeling of suffocation is entirely absent.

(2) The stage of excitement is either short or entirely absent.

(3) Vomiting during narcosis is rarer than usual.

(4) Sickness following anæsthesia does not occur.

Rosenberg's directions for employing his method are as follows : The patient is directed to blow his nose in order to free it from mucus, then two centigrammes of a 10-per-cent. solution of cocaine are sprayed into each nostril. After a pause of two minutes one centigramme of the solution is applied again to each side, and then the anæsthesia may begin. Every half hour the application of cocaine is to be renewed. Before removing the patient, the nose should receive a final spraying. At each application about one grain of the salt is used. It is important to maintain full anæsthesia uninterruptedly, as the dangerous fluctuations in the character of respiration and pulse always coincide with the necessity for crowding the anæsthetic.

The advantages claimed for his method by Rosenberg are so obvious, that at the beginning of my service of this year at the German Hospital I determined to put it to a practical test. It is the rule of the hospital that anæsthesia invariably should receive the undivided attention of two members of the house-staff. Accordingly, Dr. A. D. Mayer and Dr. C. Theobald kindly undertook to make the necessary observations and notes in 100 unselected and consecutive cases of anæsthesia, the series commencing on February 25, and ending on April 27, 1895. It gives me pleasure to express to these gentlemen my thanks for the interest taken in this investigation, and for the exactness and diligence bestowed upon their work, which is embodied in the valuable tabulated series herewith appended.

Of the 100 cases recorded, 9 were eighteen years old or less than that, 5 were sixty or more, the remnant were more than eighteen and less than sixty years old; 40 were men—60 were women. As regards habits, 6 males and 55 women,—that is 61 persons—were strictly temperate, 37 men and 2 women—that is 39—were addicted to the use of alcoholics in a more or less intemperate manner.

The choice of the anæsthetic was determined by internal and external considerations. Among the former, pulmonary and renal affections caused the exclusion of ether; in operations about the nasal and oral cavity ether was likewise excluded. In abdominal operations ether was given only in the presence of ill-compensated valvular heart-trouble. Chloroform was eschewed where the patient's pulse and habit indicated fatty changes in the heart muscle, where great fear was manifested, or where great feebleness existed from any cause preceding operation.

Where the presence of several of these counterindications made the choice of the proper anæsthetic difficult, we took refuge in the use of the A. C. E. mixture.

Chloroform was given 52 times; ether 24 times; A. C. E. mixture 13 times.

Chloroform and ether 8 times.

A. C. E. mixture and ether 2 times.

Chloroform, A. C. E. mixture, and ether 1 time.

Where two or more anæsthetics were used on the same patient, the change was determined either by the character of the pulse and respiration, or by an alteration of the general condition of the patient due to hæmorrhage or other causes not connected with the anæsthesia. Thus we have induced anæsthesia repeatedly with chloroform at the request of the patient, who expressed strong aversion to ether, continuing, however, and finishing under ether. Where the pulse was much enfeebled by loss of blood in chloroform narcosis, ether was substituted, sometimes with, mostly without, marked benefit, stimulation being effected by the hypodermatic use of alcohol, camphorated oil, and strychnia, or by means of stimulating enema, finally in extreme cases by saline venous infusion.

If, in a narcosis begun with ether, its induction was unduly prolonged, or, if excessive muscular tremors or rigidity prevailed, chloroform was substituted with marked benefit in about one-half of these cases. Where excessive cyanosis, accompanied by stertorous breathing due to a flooding of the bronchi with mucus was observed, ether was abandoned in favor of chloroform.

Whenever, chloroform being the first choice, shallow respiration and an accelerated and weak pulse gave warning, ether or A. C. E. mixture were substituted.

As to quality, the narcoses were classified as,—

(*a*) *Good.*

(*b*) *Fair*,—that is, accompanied by slight alterations in pulse and respiration, moderate cyanosis, but no seriously untoward symptoms.

(*c*) *Bad*,—that is, where marked variations from the normal pulse and respiration, considerable cyanosis, muscular tremor, or prolonged muscular rigidity were observed.

According to this arrangement we had 66 good, 14 fair, and 20 bad narcoses.

In the 66 *good* narcoses chloroform was used 36 times; ether 20 times; A. C. E. mixture 10 times.

In the 14 *fair* narcoses chloroform was employed 8 times; ether 3 times; A. C. E. mixture 3 times.

In the 20 *bad* narcoses chloroform was given 15 times; ether 3 times; A. C. E. mixture 2 times.

The overwhelming majority of the bad narcoses concerned patients of a marked alcoholic habit.

The ordinary time required for the induction of complete anæsthesia was as follows: For chloroform, 5 to 8 minutes; for ether, 15 to 20 minutes; for A. C. E. mixture, 12 to 15 minutes.

The average quantity of anæsthetic used per hour was—chloroform, 33 grammes; ether, 106 grammes; A. C. E. mixture, 84 grammes. Chloroform and the A. C. E. mixture were administered with an Esmarch chloroform mask; ether with Bigelow's inhaler.

In all of these cases Rosenberg's method was followed with this exception: that instead of a 10-per-cent. solution of cocaine, a solution of only 5 per cent. was employed.

Among the bad narcoses there were four exhibiting very grave disturbances which deserve special notice and attention. Two of the patients concerned were anæmic and much enfeebled, one suffering from carcinoma of the kidney, the other from chronic pyelitis and a renal fistula. In both cases profuse hæmorrhage was followed by collapse, which once proved fatal. In a third case of general enfeeblement, due to carcinomatosis, the operation had to be interrupted and indefinitely postponed on account of threatened heart-failure. In the last and most interesting case, that of a masturbator and neurasthenic, spasm of the glottis compelled instant tracheotomy.

The histories of these cases were as follows:

Case 71.—Mr. R., aged sixty-one years. Carcinoma of kidney. Patient anæmic, feeble, and emaciated; pulse, as a result of preparatory stimulation, of good force and quality at the beginning of the operation; suprapubic cystotomy was followed by nephrectomy; the pulse and respiration remained good during an hour and thirty minutes, but a rather profuse hæmorrhage unavoidably encountered in separating the kidney from the adherent tissues was followed by a marked change in the pulse, which became thready and very rapid, accompanied by evident collapse and loss of reflexes. The adminis-

tration of chloroform was immediately stopped, and hypodermatic stimulation and a saline infusion of 1000 grammes were resorted to. The patient rallied sufficiently to permit the completion of the operation, which had lasted two hours and forty minutes. The amount of chloroform, 45 grammes, was very moderate. Three hours after the operation the patient collapsed again and died, clearly as a result of acute anæmia.

CASE 80.—Mrs. F., aged thirty-two years. A nephrectomy had to be performed on the weak, anæmic, and very fat and flabby woman, who had been suffering from a renal fistula for a year and a half, the consequence of a nephrotomy done to relieve a pyelonephritis caused by an insuperable obstruction of the corresponding ureter. The pulse, which was at the outset of the operation small and full, became very rapid, soft, and thready as soon as the copious oozing, unavoidably encountered in separating the kidney, had commenced. Chloroform was instantly withdrawn, and the pulse not responding to hypodermatic and rectal stimulation, saline transfusion was attempted. It could not be done, however, because all the veins, usually exposed for this purpose, were found to be too small and too brittle to admit the introduction and tying-in of a cannula. Consequently about 150 grammes of saline solution were forced into the subcutaneous tissue of the belly, and patient rallied enough to permit the completion of the operation. Her recovery was uneventful. Quantity of chloroform used was 30 grammes.

CASE 86.—Mrs. M., aged fifty years. For advanced carcinoma of breast in an anæmic, ill-nourished woman of small stature and proportions, amputation was to be done, and chloroform was administered, under the influence of which the patient went quietly, without struggling or cyanosis, the pulse beating 60 times to the minute with a soft stroke of moderate force. When she had lost about three or four ounces of blood, the pulse suddenly dropped to 30 beats per minute, becoming still slower, feebler, and finally imperceptible. Respiration had also ceased gradually, and there was a marked pallor of the face, the lips showing light cyanosis. The operation was stopped, likewise the administration of chloroform, and the usual means of resuscitation, including the infusion of 1000 grammes of a normal salt solution, were resorted to. During transfusion the pulse and respiration became again perceptible, and the patient was bundled off to bed and surrounded with hot bottles. No

vomiting at all occurred, but the pulse and respiration remained feeble for three days, during which energetic stimulation had to be employed. The breast was not removed. Quantity of chloroform used was twenty grammes.

It seemed to me that in this case the alarming retardation of respiration and pulse was not caused directly either by the anæsthetic or the loss of blood,—though, of course, their value as important factors cannot be denied. The condition of the patient reminded me vividly of another case, in which serious collapse, with dyspnœa, slow pulse, and profuse sweating, was caused by the hypodermatic injection of a few drops of a weak cocaine solution. To be sure, it is difficult to explain in this last case why cocaine-poisoning did not show itself with the first application of the alkaloid, if the patient was over-susceptible to its influence.

Case 95.—This, the most interesting and important one of the cases related, concerned Charles M., a grocery clerk, seventeen years of age, apparently in good physical condition. He had the florid countenance and flaxen hair of the North German, with some marks of infantile scrofulosis, was confessedly a strenuous masturbator and manifested various signs of neurasthenia. The heart, lungs, and kidneys were found to be normal. He sought cure of a small inguinal hernia, for which he was admitted, and Bassini's operation was to be performed on April 25. During the primary stage of chloroform anæsthesia the patient struggled somewhat, the pulse being slow and forcible, though the respiration was rather shallow. Muscular twitchings occurred throughout the anæsthesia, and the patient was at no time completely anæsthetized. When the hernial sac was opened,—that is, thirty-five minutes after the beginning of narcosis,—and when twenty-five grammes of chloroform had been used by the drop method, the respiration, which had been shallow and superficial from the beginning, suddenly ceased, with immediate extreme cyanosis of the entire integument, forcibly reminding us of suffocation from a mechanical impediment to respiration, with this difference, that there were no automatic efforts present in this case to overcome the impediment. During this and all the subsequent phases of the

incident the pulse remained strong and full, becoming somewhat accelerated as time went on. The operation being discontinued, artificial respiration by Sylvester's method was attempted but led to no success, it becoming manifest that no air could pass in or out of the lungs. Though the anæsthetizers said positively that no sponge or foreign body was lost in the throat, careful search was made with the finger down to the larynx. Renewed, more forcible attempts at artificial respiration, flagellations of the thorax, extractions of the tongue, and faradic irritation of the phrenic nerve also proving ineffectual, the trachea was rapidly incised below the isthmus. At this time the pulse was still firm and full, though somewhat rapid,—perhaps 90 beats per minute,—and the patient's face, conjunctivæ, tongue, and lips nearly black. When artificial respiration was resumed, the noise caused by the entrance into and exit of air from the tracheal wound could be clearly discerned, and soon the waning of the cyanosis was observable. Five minutes after tracheotomy a pause was made with the artificial respiration, but patient failed to breathe spontaneously, cyanosis becoming as deep as ever. The pulse remained unchanged. Sylvester's method was resumed and practised altogether for twenty minutes, when the first spontaneous effort at respiration became clearly evident. Repeatedly, artificial respiration had to be resumed, as the patient had apparently lost the continuity of the chain of reflexes presiding over the act of respiration, and conveying the automatic response of the respiratory apparatus to carbonic acid intoxication of the respiratory centre. Only when consciousness returned, and patient was directed to breathe, did his respiration become normal. The cyanosis then disappeared.

It is to be noted that with a violent active spasm of the glottis there was combined a paralysis of the respiratory centre. The operation remained unfinished, and the tracheal cannula being withdrawn, the wounds were dressed. Recovery was uneventful. There is no doubt that a complete failure of Rosenberg's method must be recorded in this case.

Conclusions.

As a result of the observations made in the 100 cases of anæsthesia serving as a basis for this study, we have found that

the cocainization of the nasal mucous membrane preceding, and during surgical anæsthesia, considerably diminishes the distress and oppression felt by the patient at the beginning. There was among the cases recorded that of a physician, who had been etherized before, and to whom the process then was extremely disagreeable. This time, his sense of smell being dulled, he experienced no feeling of suffocation, no tickling or irritation inviting coughing or retching, and his judgment was, that the new process was certainly a great improvement over older methods.

In this, as well as in almost all the other cases,—excepting those of confirmed alcoholics,—the observation was made that, at the beginning of narcosis, the patients manifested less reflex irritation than usual; that they entered insensibility more rapidly and quietly, with less struggling, coughing, and nausea; that, especially when ether was used, the mask could be approached to the face of the patient much quicker, without opposition or resistance. In conformity with this, the later stages of anæsthesia were also more quiet and more free from disturbing interruptions than usual. But here again habitual alcoholists formed an exception.

On the other hand, perhaps ten times, and in about from twenty to twenty-five minutes after the first application of cocaine, with no external reason, such as, for instance, profuse hæmorrhage, a marked acceleration of the pulse-rate, with facial pallor, was observed, followed by profuse sweating, probably the effect of cocaine. It seemed to us, also, that cocaine anæsthesia of the mucous membrane tended to diminish the depth of the respiration.

As to the *after-effects*, we have derived the impression that in the cases observed there have been less nausea, vomiting, headache, and general malaise than is the rule in ordinary anæsthesia. It must be said, however, that in a few instances patients, who did not vomit at all during the first twenty-four or forty-eight hours, vomited a great deal on the second and third day without any recognizable cause.

As to the anæsthesia of alcoholics, where there is much need of improvement, Rosenberg's method does not afford any marked advantage over older methods.

On the whole, it is safe to conclude that in view of the ease and simplicity of the procedure, of the absence of apparent risk, and on account of the undeniable diminution of the trying subjective effects upon the patient caused by the use of cocaine upon the nasal mucous membrane, its extended and systematic trial deserves encouragement.

ANALYTICAL TABLE OF ONE HUNDRED CASES OF

No.	Date.	Journal Number.	Sex.	Age.	Habits.	General Condition.	Operation.	Anæsthetic.	Grammes.
1	Feb. 25	375	Male.	65	Moderate drinker.	Robust, well nourished.	Intracranial neurectomy.	Chlor.	55.00
2	" 25	296	"	23	Moderate drinker.	Neurasthenic.	Hæmorrhoids.	Ether	90.00
3	" 25	368	"	18	Moderate drinker.	Good, well nourished.	"	Chlor.	25.00
4	" 25	363	"	47	Moderate drinker.	Robust, well nourished.	"	Chlor.	20.00
5	" 26	333	Female.	54	Moderate drinker.	. . . . .	Salpingo-oöphorectomy.	Ether	140.00
6	" 27	375	Male.	65	See Feb. 25.	. . . . .	Primary operation completed.	Chlor.	35.00
7	" 28	391	"	55	Moderate intemperance.	Robust, well nourished.	Bassini.	Chlor.	35.00
8	" 28	344	Female.	42	Moderate intemperance.	. . . . .	Partial resection inferior maxilla.	Chlor.	15.00
9	" 28	402	Male.	18	Moderate intemperance.	Robust, well nourished.	For phlegmon of arm.	Ether	50 00
10	Mar. 1	343	Female.	27	Temperate.	Anæmic; mitral regurgitation.	Colpo-perineorrhaphy.	Ether	85.00
11	" 1	370	"	22	"	Robust, well nourished.	Divulsion and curettage.	Chlor.	17.00
12	" 2	428	"	35	"	Anæmic, ill nourished, excitable.	Breast amputation.	Chlor. Ether	25.00 55.00
13	" 2	399	Male.	44	Moderate intemperance.	Diabetes mellitus, robust, well nourished.	Fistula in ano.	Chlor.	12.00
14	" 2	415	"	39	Moderate intemperance.	Ill nourished.	Abscessus periproctiticus.	Chlor.	17.00
15	" 2	361	Female.	31	Temperate.	Very nervous, pale, and ill nourished.	Exploratory puncture.	Chlor.	13.00
16	" 4	204	"	42	"	Very nervous temperament.	Suprapubic cystotomy; plastic on urethra.	Chlor. Ether	23.00 80.00

ANÆSTHESIA AFTER COCAINIZATION OF NARES.

Time for Induction of Narcosis.	Duration of Narcosis.	Hæmorrhage.	Vomiting	Pulse.	Respiration.	General Remarks and Cyanosis.
M.	H. M.					
25	1 40	Considerable.	Retching.	First, full, forcible; second, small, very slow, weaker.	First, deep; second, superficial.	Vomited twice; moderate cyanosis.
20	35	. . . . .	. . . . .	Full and strong.	Deep.	
15	30	. . . . .	. . . . .	" "	"	Cyanosis.
15	25	. . . . .	. . . . .	" "	Intermediate.	
20	1 25	. . . . .	. . . . .	" "	Deep.	Vomited several times.
15	1 15	Slight.	Considerable retching at outset.	Full, slow, and forcible; at one time irregular for a few moments.	Intermediate.	Retching after narcosis.
13	1	"	None.	Full, slow, forcible.	Deep.	Vomited twice after narcosis.
12	25	Considerable.	"	Full and slow.	"	Vomited.
10	25	. . . . .	"	Full, slow, forcible.	"	Some.
12	55	. . . . .	Retching.	Small, full, rapid.	"	None.
7	30	. . . . .	. . . . .	Full, forcible, rapid.	Shallow.	None.
10	35 45	Considerable.	Retching.	Slow, soft, moderate force at outset; became soft and feeble under chloroform, and somewhat stronger under ether.	Deep.	Blue finger-tips before and during narcosis.
10	25	. . . . .	. . . . .	Full, slow, forcible.	Full and deep.	No struggling; vomited once after narcosis.
5	20	. . . . .	. . . . .	Full, rapid, strong.	Deep, jerky, due to reaction, and rapid.	No struggling.
13	27	. . . . .	Retching.	Soft, full, and slow.	Full and slow.	Heart action forcible, due to primary excitation.
5	45 30	Slight.	. . . . .	Full, slow, and soft; became slower and softer during period of respiratory failure.	Slow, full, and deep; at end of ½ hour respiration suddenly became very shallow and very slow; artificial respiration for one minute under ether respiration again became slow and full.	Throughout narcosis there was tremor of lower extremities.

ANALYTICAL TABLE OF ONE HUNDRED CASES OF

No.	Date.	Journal Number.	Sex.	Age.	Habits.	General Condition.	Operation.	Anæsthetic.
								Grammes.
17	Mar. 4	351	Female.	35	Temperate.	Well nourished, feverish.	Scarification for lymphangitis.	Chlor. 12.00
18	" 4	. . .	Male.	.	"	Robust, well nourished.	For phlegmon of finger.	Chlor. 13.00
19	" 5	397	Female.	24	"	Pale, anæmic, and ill nourished.	Oöphorectomy; vaginal cœliohysterorrhaphy.	Ether 155.00
20	" 5	421	"	28	. . . . .	Robust, well nourished, very excitable.	Laparotomy.	Ether 120.00 Chlor. 7.00
21	" 5	382	"	34	. . . . .	Robust, well nourished, nervous.	Vaginal cœliohysterorrhaphy.	A.C.E. 130.00
22	" 7	451	"	.	. . . . .	Robust, well nourished.	Curettage; cœliohysterorrhaphy.	Chlor. 22.00
23	" 7	('94.) 1762	"	18	Hysterical	. . . . .	Ankylosis patella.	Chlor. 30 00
24	" 8	420	"	26	Temperate.	Mitral regurgitation, nervous, good health.	Oöphorectomy; removal of appendix.	Ether 160.00

No.	Date.	Journal Number.	Sex.	Age.	Anæsthetic.	Induction of Narcosis.	Duration of Narcosis.	Operation.	General Condition.	Habits.
					Grammes.	M.	H. M.			
25	Mar. 11	450	Female.	36	Chlor. 21	10	1	Removal of goitre.	Anæmic, ill nourished.	Temperate.
26	" 11	407	Male.	39	Chlor. 10	15	25	Incision of phlegmon.	Robust, well nourished.	Drinker.

ANÆSTHESIA AFTER COCAINIZATION OF NARES.—*Continued.*

Time for Induction of Narcosis.	Duration of Narcosis.	Hæmorrhage.	Vomiting.	Pulse.	Respiration.	General Remarks and Cyanosis.
M.	H. M.					
10	20	. . . . .	. . . . .	Slow, full, strong.	Slow and full.	
4	30	Slight.	. . . . .	" " "	" "	Vomited first hour.
10	1 45	Considerable.	. . . . .	At outset, small, soft and rapid; at end of twenty minutes stimulated with $\frac{1}{10}$ grain strychnine; pulse slower, fuller, small, but of good force.	Intermediate and slow; became superficial.	
20	45 25	. . . . .	. . . . .	Rapid, full, strong; slower, full, strong.	Deep and forcible, but impaired by excessive secretion of saliva and muscular rigidity; chloroform, slow and deep.	Throughout ether narcosis marked muscular rigidity, jaw tightly clinched, profuse salivation, all abating with chloroform.
20	1	. . . . .	. . . . .	Slow, small, of good force.	Slow, intermediate.	
15	1 5	. . . . .	Twice.	Irregular in frequency before operation; during narcosis, slow, full, strong, regular.	Intermediate.	
15	1 5	. . . . .	. . . . .	Full, slow, strong.	"	Vomited.
20	1 25	Slight.	. . . . .	Full, soft, rapid.	Deep.	Some cyanosis.

Hæmorrhage.	Vomiting.	Cyanosis.	Struggling, etc.	Stimulants.	Pulse.	Respiration.	After-Effects.
Moderate.	None.	None.	None.	. . . .	Slow, full, strong.	Moderate depth.	Vomited first 24 hours.
. . . .	. . . .	. . . .	Struggled and talked throughout narcosis.	. . .	" " "	" "	

ANALYTICAL TABLE OF ONE HUNDRED CASES OF

No.	Date.	Journal Number.	Sex.	Age.	Anæsthetic.	Induction of Narcosis.	Duration of Narcosis.	Operation.	General Condition.	Habits.
					Grammes.	M.	H. M.			
27	Mar. 11	170	Male.	46	Chlor. 20	15	35	For fistula in ano.	Robust, well nourished.	Moderate.
28	" 14	483	"	44	Chlor. 7 Ether 60	20	20 40	Cœliotomy.	Pale, weak, thin; heart-sounds feeble but no murmur.	"
29	" 14	454	Female.	8	Chlor. 13	5	30	Plastic axilla.	Good.	Good.
30	" 16	488	"	49	Ether 135	12	2 15	Amputation of breast.	Mitral regurgitation; good health.	"
31	" 16	. .	"	26	Chlor. 20 Ether 55	17	37 30	Repair of sphincter ani.	General circulation poor, cyanosis, and cold hands.	"
32	" 16	497	Male.	50	Ether 120	25	30	Axillary abscess.	Heart-action feeble, general cyanosis.	Drinker.
33	" 16	482	"	62	Ether 110	. . .	23	For carcinoma of face	Mitral regurgitation.	"
34	" 17	493	"	53	Chlor. 20	8	35	For hydrocele.	Good.	Moderate drinker.
35	" 17	518	"	49	Chlor. 15	7	25	For abscess of arm.	Pale, ill nourished.	Moderate drinker.
36	" 18	525	"	54	Chlor. 35	7	1 5	For prostatic abscess.	Well nourished; sluggish, venous circulation.	Moderate drinker.
37	" 18	494	"	58	Chlor. 55	30 min. for complete relaxation.	1 25	For chronic appendicitis.	Good; high temperature, 103° F.	Moderate drinker.
38	" 18	('94.) 1762	Female.	18	Chlor. 10	8	15	For ankylosed knee.	Hysterical.	

ANÆSTHESIA AFTER COCAINIZATION OF NARES.—*Continued.*

Hæmorrhage.	Vomiting.	Cyanosis.	Struggling, etc.	Stimulants.	Pulse.	Respiration.	After-Effects.
. . . .	. . . .	. . . .	Struggled and talked.	. . . .	Slow, full, strong.	Moderate depth.	No vomiting.
. . . .	. . . .	. . . .	Reacted several times during a light narcosis.	Strychnine, caffeine, whiskey.	Slow, full, and soft at outset; became slower and very soft under chloroform, and but slight improvement later.	" "	Vomited several times during first 24 hours.
. . . .	. . . .	. . . .	Some struggling.	. . . .	Slow, full, strong.	" "	
Slight.	. . . .	. . . .	Slight at outset.	. . . .	Slow, full, moderate force.	Deep.	
. . . .	. . . .	Some.	Reacted throughout chloroform narcosis, which was incomplete; ether good.	. . . .	Slow, full, moderate force; became slower and feebler under chloroform; better with ether.	Moderate.	
. . . .	. . . .	Moderate.	Fought; marked muscular tremor; reacted throughout an incomplete narcosis.	. . . .	Small, slow, full.	"	
. . . .	. . . .	. . . .	Incomplete narcosis.	. . . .	Slow, full, moderate force.	Deep.	
. . . .	. . . .	. . . .	. . . . .	. . . .	Slow, full, and forcible.	Moderate.	
. . . .	. . . .	. . . .	. . . . .	. . . .	Slow, full, moderate force.	"	Vomited very little; slept well.
Slight.	. . . .	Moderate.	Hacking cough; reacted once.	. . . .	Slow, full, strong.	Deep.	
"	. . . .	Some.	Induction long; required 30 grammes; no struggling; reacted once.	Magendie at outset.	Rapid, full, moderate force.	"	No vomiting after first hour; slept fairly well.

ANALYTICAL TABLE OF ONE HUNDRED CASES OF

No.	Date.	Journal Number.	Sex.	Age.	Anæsthetic.	Induction of Narcosis.	Duration of Narcosis.	Operation.	General Condition.	Habits.
					Grammes.	M.	H. M.			
39	Mar. 19	474	Female.	21	Ether 75	20	35	Curettage.	. . . . .	. . . .
40	" 19	523	Male.	33	A. C. E. 55	20	45	For abdominal fistula.	Good.	Good.
41	" 20	491	"	31	Chlor. 65	20	1 35	Inguinal hernia.	Tall, robust, very plethoric, general condition good.	Beer drinker.
42	" 20	79 ('94)	Female.	19	Chlor. 18	3	35	Abscess of ankle.	Good, well nourished.	Good.
43	" 20	541	Male.	23	Chlor. 30	13	45	Phlegmon of hand.	Good, robust, no fever.	Drinker.
44	" 21	413	"	49	Chlor. 45	20	1 20	Gastrostomy.	Chronic bronchitis, stricture of œsophagus, emaciated, respiratory embarrassment due to pressure.	Moderate drinker.
45	" 22	544	"	39	Chlor. 45	15	1 35	Angio-lipoma of chin.	Good, robust.	Moderate drinker.
46	" 22	525	"	54	Chlor. 20	10	45	Secondary hæmorrhage.	Sluggish, venous circulation; plethoric.	Moderate drinker.
47	" 22	545	Female.	7	Chlor. 10	3	35	Appendicitis.	Pale, weak, feverish.	. . . .
48	" 22	505	"	23	Chlor. 25	10	1	Varicose veins.	Good, robust.	. . . .

ANÆSTHESIA AFTER COCAINIZATION OF NARES.—*Continued.*

Hæmorrhage.	Vomiting.	Cyanosis.	Struggling, etc.	Stimulants.	Pulse.	Respiration.	After-Effects.
Slight.	. . . .	Some.	Very quietly.	Strychnine $\frac{1}{10}$ gr.	Full, soft, moderate rapidity and force, and became imperceptible; when mask was removed pulse reappeared, disappearing again when ether was administered; after observing this three times, anæsthetic was discontinued.	Very superficial from the outset, and but slightly altered during narcosis.	
"	. . . .	. . . .	Quiet.	. . .	Slow, full, strong.	Moderate depth.	
. . . .	. . . .	Considerable.	Went under quietly; reacted frequently; never deeply under.	Magendie, ♏ viii at outset.	Slow, full, forcible.	Moderate depth; respiratory cyanosis.	
Slight.	. . . .	Marked general cyanosis respiratory.	Induction quiet; reacted slightly a number of times.	Magendie, ♏ viii; strychnine $\frac{1}{10}$ grain.	At outset, slow, full, moderate force; in ten minutes became dicrotic and irregular; stimulated and pulse became slow, full, strong, remaining so throughout narcosis.	Irregular; sometimes deep, at others shallow; cyanosis necessitated stopping anæsthetic a number of times, patient remaining cyanotic, however, throughout operation.	
"	. . . .	. . . .	None.	. . . .	Slow, full, strong.	Moderate	
Considerable before narcosis.	. . .	Marked general cyanosis respiratory.	Muscular rigidity throughout.	. . . .	Slow, full, moderate force; became somewhat weaker.	Interfered with by rigidity of muscles, causing cyanosis.	
. . . .	. . . .	. . . .	Primary excitement.	. . . .	Slow, full, strong.	Moderate depth.	
Slight.	. . . .	. . .	None.	. . . .	" " "	" "	

ANALYTICAL TABLE OF ONE HUNDRED CASES OF

No.	Date.	Journal Number.	Sex.	Age.	Anæsthetic.	Induction of Narcosis.	Duration of Narcosis.	Operation.	General Condition.	Habits.
					Grammes.	M.	H. M.			
49	Mar. 22	547	Male.	26	Chlor. 25	15	1	Inguinal fistula.	Well nourished.	Moderate drinker.
50	" 22	557	"	23	" 15	12	25	Ischio-rectal abscess.	Well nourished.	Moderate drinker.
51	" 23	533	Female.	30	" 17 Ether 10	8	50 15	Nephrotomy.	Pale, anæmic, feeble; slight heart murmur at apex.	. . . .
52	" 23	512	"	21	Chlor. 38	13	1 30	For tubercul'r synov. of hand.	Good.	. . . .
53	" 24	559	"	35	Ether 80	15	50	For recto-vaginal fistula.	Presystolic murmur at apex; good, well nourished.	. . . .
54	" 25	504	Male.	21	Chlor. 68	13	1 30	Castration; removal of seminalvesicle.	Strong, well nourished.	Moderate drinker.
55	" 25	532	Female.	24	" 15	15	20	Cystoscopy.	Hysterical, anæmic, ill-nourished.	. . . .
56	" 26	560	"	19	Ether 140	15	1 30	Hysterorrhaphy; cœliotomy; tubo ovarian disease.	Healthy, well nourished.	. . . .
57	" 26	578	"	46	" 110	20	1 10	Antero-posterior colporrhaphy.	Healthy, well nourished.	. . . .
58	" 26	503	"	36	A. C. E. 30	20	25	Examination.	Healthy, well nourished.	. . . .
59	" 28	454	"	8½	Chlor. 25	5	1 40	Thiersch skin-graft.	Anæmic.	. . . .
60	" 28	('94) 1775	Male.	50	" 50	. . .	1	Resection anterior crural nerve.	Good.	Moderate drinker.
61	" 28	532	Female.	24	" 25	10	45	Epicystotomy.	Hysteria, anæmic, ill nourished.	. . . .

ANÆSTHESIA AFTER COCAINIZATION OF NARES.—*Continued.*

Hæmorrhage.	Vomiting.	Cyanosis.	Struggling, etc.	Stimulants.	Pulse.	Respiration.	After-Effects.
Slight.	. . . .	. . . .	. . . . .	. . . .	Slow, full, strong.	Moderate depth.	
"	. . . .	. . . .	. . . . .	. . . .	" " "	" "	
Moderate.	. . . .	. . . .	. . . . .	Strychnine $\frac{1}{10}$ grain.	At first slow, full, moderate force; became weaker and slower; with stimulant and ether, some improvement.	Superficial.	Vomited several times.
None.	. . . .	. . . .	. . . . .	. . . .	Slow, full, moderate force.	Moderate depth.	
Slight.	. . . .	. . . .	During induction.	. . . .	Slow, full, moderate force.	Deep.	
"	. . . .	Slight.	Rigidity of muscles reacted once.	. . . .	Slow, full, strong.	Moderate depth.	
. . . .	. . . .	. . . .	Muscular tremor.	. . . .	Slow, full, moderate force.	Irregular of moderate depth, and superficial.	
"	. . . .	. . . .	. . . . .	. . . .	Slow, full, strong.	Moderate depth.	
"	. . . .	. . . .	During induction.	. . . .	" " "	Deep.	
. . . .	. . . .	. . . .	. . . . .	. . . .	Slow, full, moderate force.	Moderate depth.	No vomiting.
. . . .	. . . .	. . . .	None.	Strychnine $\frac{1}{30}$ grain.	Slow, full, moderate force; became weak.	" "	No vomiting.
. . . .	. . . .	Considerable respiratory.	Tonic muscular contraction, especially jaw and chest muscles.	Magendie.	Slow, full, strong.	Deep, irregular, stertorous.	Narcosis incomplete: felt very well; no vomiting.
Slight.	. . . .	. . . .	Clonic muscular contraction during induction.	Magendie.	Slow, full, moderate force; became slower, softer, and less forcible.	Superficial, at times stertorous.	

ANALYTICAL TABLE OF ONE HUNDRED CASES OF

No.	Date.	Journal Number.	Sex.	Age.	Anæsthetic.	Induction of Narcosis.	Duration of Narcosis.	Operation.	General Condition.	Habits.
					Grammes.	M.	H. M.			
62	Mar. 29	573	Female.	25	Ether 75 A. C. E. 15	. . .	25 15	Curettage.	Robust, pale, nervous.	. . . .
63	" 29	562	"	44	" 85	15	1 25	Cœliotomy.	. . . . .	. . . .
64	" 30	589	Male.	29	Chlor. 20	8	20	For inguinal fistula.	Good, robust.	Moderate drinker.
65	" 30	599	"	26	" 35	. . .	30	Abscess of neck.	Good, robust.	Moderate drinker.
66	. . . .	593	Female.	33	A. C. E. 115	20	1 50	Hysterectomy.	Good, septic, temperate.	. . . .
67	Apr. 1	588	"	27	Chlor. 20	8	40	For cyst of neck.	Good.	. . . .
68	" 1	583	"	55	" 35	12	55	For fistula in ano.	Well nourished, fat.	. . . .
69	" 2	582	"	19	A. C. E. 15 Chlor. 15 Ether 125	20	1 40	Cœliotomy for cysts of broad ligament.	Well nourished.	. . . .
70	" 2	594	"	26	A. C. E. 40	15	30	Curettage.	Pale, anæmic, emaciated, hysterical.	. . .
71	" 3	629	Male.	61	Chlor. 45	8	2 40	Epicystotomy and nephrectomy.	Anæmic and somewhat emaciated.	. . . .
72	" 4	625	"	10	" 35	12	1 30	Appendicitis.	Well nourished.	. . . .

ANÆSTHESIA AFTER COCAINIZATION OF NARES.—*Continued.*

Hæmorrhage.	Vomiting.	Cyanosis.	Struggling, etc.	Stimulants.	Pulse.	Respiration.	After-Effects.
Slight.	. . . .	Moderate.	Considerable during primary stage; rigid during entire ether narcosis; relaxed under A. C. E.	. . . .	Slow, full, moderate force.	At first deep, then more superficial.	
Moderate.	Twice during narcosis.	Some.	None.	. . . .	Slow, full, moderate force.	Moderate depth.	
. . . .	. . . .	Some.	At first.	. . . .	Slow, full, moderate force.	" "	
. . . .	. .	Moderate.	Struggled and rigid throughout.	. . . .	Slow, full, strong.	Respiration moderate.	
Great deal.	. . . .	. . . .	None.	. . . .	" " "	Respiration moderate.	
Very slight.	Retching twice during narcosis.	. . . .	None.	. . . .	Regular, slow, strong.	Noiseless and deep.	
. . . .	. . . .	Considerable.	. . . . .	. . . .	Varied; slow and full, then more rapid.	Troublesome on account of tongue falling back repeatedly; deep and regular.	
Moderate.	. . . .	. . . .	. . . . .	. . . .	Varied; pulse under chloroform got smaller and feebler, then stronger again under ether.	Deep and regular.	Vomited three times n 24 hours; feels well.
. . . .	. . . .	. . . .	. . . . .	. . . .	Slow and of fair force.	At first superficial; later on deep and regular.	Vomited once in 24 hours; feels very well.
Great deal.	. . . .	. . . .	. . . . .	Strychnine $\frac{1}{10}$ grain, and $\frac{1}{20}$ grain of caffeine and enemata.	Strong, full, but somewhat rapid; later on small and feeble and rapid, due to hæmorrhage; then collapse.	Noiseless and deep.	
. . . .	Once.	Considerable.	. . . . .	. . . .	Good, strong, full, and slow.	Deep, noiseless.	

ANALYTICAL TABLE OF ONE HUNDRED CASES OF

No.	Date.	Journal Number.	Sex.	Age.	Anæsthetic.	Induction of Narcosis.	Duration of Narcosis.	Operation.	General Condition.	Habits.
					Grammes.	M.	H. M.			
73	Apr. 4	613	Male.	36	Chlor. 50	25	1	For stricture of urethra (internal and external).	Well nourished.	Marked alcoholic.
74	" 5	616	"	32	Ether 120	8	1 20	Double salpingo-oöphorectomy.	Good.	None.
75	" 5	617	Female.	37	" 145	12	1 35	Cœliotomy for ventral hernia.	Good.	None.
76	" 9	503	"	36	" 110	20	1	Extirpatio tubæ et ovarii.	Anæmic, somewhat emaciated.	None.
77	" 9	649	"	36	A. C. E. 55	11	55	Amputatio cervicis.	Fair; has endocarditis (mitral regurgitation.)	. . . .
78	" 10	672	"	36	Chlor. 65	20	2	Internal and external urethrotomy.	Good.	. . . .
79	" 11	666	Female.	39	Ether 120	16	1 15	Curettage and double oöphorectomy.	Fairly well nourished.	. . . .
80	" 11	647	"	32	Chlor. 30 Ether 40	12	1 20	Nephrectomy.	Fat, but anæmic.	. . . .
81	" 11	595	Male.	39	Chlor. 70	25	1	Epicystotomy.	Fair.	Alcoholic.
82	" 11	675	Female.	25	" 25	12	40	Hæmorrhoids.	Good.	. . . .
83	" 11	670	Male.	47	Ether 90	20	35	Fistula in ano.	Fair; mitral regurgitation.	Alcoholic.
84	" 12	655	Female.	25	A. C. E. 140	25	1 40	Vaginal hysterectomy.	Good.	. . . .

ANÆSTHESIA AFTER COCAINIZATION OF NARES.—*Continued.*

Hæmorrhage.	Vomiting.	Cyanosis.	Struggling, etc.	Stimulants.	Pulse.	Respiration.	After-Effects.
. . . .	. . . .	. . . .	Considerable.	. . . .	Strong, full, regular.	Deep and regular.	Vomited day after operation.
. . . .	. . . .	. . . .	None.	None.	Good.	Deep and regular.	Within seven hours vomited five times; otherwise well.
Very little.	None.	None.	None.	None.	Strong, full, regular.	Deep, at times easy, at other times snoring.	Never vomited; on third day complained of headache.
Very little.	None.	None.	None.	None.	Regular, but not very strong.	Deep and regular.	Vomited four times in 6 hours.
Slight.	. . . .	. . . .	. . . . .	. . . .	Regular, slow, and full.	Deep, regular, noiseless.	
Moderate.	Slight retching at beginning of narcosis.	. . . .	None.	. . . .	Full, slow, and regular.	Deep and regular, noiseless.	Slight retching at end of narcosis
Moderate.	. . . .	. . . .	. . . . .	. . . .	Slow, full, of moderate force.	Of moderate depth.	Vomited a good deal.
Profuse.	. . . .	. . . .	. . . . .	Caffeine and strychnine; whiskey transfusion.	Small; later on very feeble, small, and rapid.	Of moderate depth.	Vomited a little on second day.
Slight.	. . . .	. . . .	Considerable.	. . . .	Of fair force.	Noisy, superficial.	No vomiting
. . . .	. . . .	. . . .	Slight.	. . . .	Of good force.	Deep and noiseless.	
. . .	. . . .	Marked.	Slight.	. . . .	Small, rapid, tumultuous at times.	Superficial.	
Moderate.	. . . .	. . . .	. . . . .	. . . .	Somewhat small, but regular.	Of moderate depth, but regular.	

ANALYTICAL TABLE OF ONE HUNDRED CASES OF

No.	Date.	Journal Number.	Sex.	Age.	Anæsthetic.	Induction of Narcosis.	Duration of Narcosis.	Operation.	General Condition.	Habits.
					Grammes.	M.	H. M.			
85	Apr. 12	658	Female.	40	A.C. E. 125	15	55	Ventral hernia.	Good, but very fat.	. . . .
86	" 15	654	"	50	Chlor. 20. Cocainized twice with 5 per cent. solution.	Never fully under.	40	Carcinoma mammæ.	Fairly good; anæmic.	. . . .
87	" 15	490	"	26	Ether 100	15	1	Plastic on rectum.	Fair.	. . . .
88	. . . .	. .	"	51	" 70	15	40	Amputatio digiti.	Good.	. . . .
89	. . . .	. .	"	29	A. C. E. 75	8	45	Amputatio cervicis et curettage.	Fair.	. . . .
90	. . . .	. .	"	33	Ether 130	20	1 05	Oöphorectomy and ventro-fixation of uterus.	Stout, corpulent.	. . . .
91	. . . .	. .	"	31	A. C. E. 70 Ether 30	80	1 1	Cœliotomy for tubo-ovarian disease.	. . . . .	. . . .
92	Apr. 22	753	"	25	A.C. E. 135	10	10	Cœliotomy for tubo-ovarian disease.	Good.	. . . .

ANÆSTHESIA AFTER COCAINIZATION OF NARES.—*Continued.*

Hæmorrhage.	Vomiting.	Cyanosis.	Struggling, etc.	Stimulants.	Pulse.	Respiration.	After-Effects.
. . . .	Some retching during narcosis.	. . . .	. . . . .	. . . .	Fair force and regular.	Superficial.	None.
None.	. . . .	Marked followed by pallor.	None.	Strychnine $\frac{1}{10}$ grain.	From commencement of narcosis pulse was slow (60 a minute), soft, of moderate force, became slower and softer, and finally imperceptible	Superficial, then at end of forty minutes stopped for a few seconds. Artificial respiration tried successfully.	None.
Slight.	. . . .	. . . .	. . . . .	. . . .	Good, regular.		
. . . .	. . . .	. . . .	Slight.	. . . .	Good, forcible, regular, and fairly rapid.	Deep.	No vomiting.
. . . .	. . . .	. . . .	. . . . .	. . . .	Regular, slow, and forcible.	Moderately deep, regular.	No vomiting; retching.
. . . .	. . . .	. . . .	. . . . .	. . . .	Regular, fairly forcible.	Moderately deep.	Vomiting twice.
Slight.	. . . .	. . . .	. . . . .	Strychnine and caffeine, $\frac{1}{10}$ grain.	At first rapid, small; then slower and somewhat fuller; then when under narcotic pulse became gradually smaller and feebler; at end of forty-five minutes, collapse; under ether became better.	Very shallow.	Vomited for several days after operation.
. . . .	. . . .	. . . .	. . . . .	. . . .	Regular, of good quality.	Rather noisy and superficial part of time.	Vomited slightly.

ANALYTICAL TABLE OF ONE HUNDRED CASES OF

No.	Date.	Journal Number.	Sex.	Age.	Anæsthetic.	Induction of Narcosis.	Duration of Narcosis.	Operation.	General Condition.	Habits.
					Grammes.	M.	H. M.			
93	Apr. 21	. .	Female.	54	A. C. E. 55	12	55	Laparotomy for carcinoma.	Poor.	. . . .
94	" 23	. .	"	34	Ether 140	12	1 40	Cystocele and rectocele.	Good (fat); mother, married fifteen years; fourteen children.	. . . .
95	" 25	. .	Male.	17	Chlor. 25	35	35	Hernia inguinalis; tracheotomy.	Fair.	Masturbator.
96	" 25	. .	"	35	Ether 125	20	1	Tuberculosis of knee.	Poorly nourished.	. . . .
97	" 26	772	Female.	26	A. C. E. 107	25	1 10	Hysterectomy.	Poor.	. . . .
98	" 27	592	"	60	Ether 135	15	1 25	Gastro-enterostomy (Murphy button).	Rather poor; myocarditis.	. . . .
99	" 27	. .	Male.	31	Chlor. 15 Ether 50	15	50	Cœliotomy.	Fair.	Moderate beer drinker.
100	" 27	. .	"	29	Chlor. 25	15	40	For hydrocele of cord.	Very good.	Moderate beer drinker.

ANÆSTHESIA AFTER COCAINIZATION OF NARES.—*Concluded.*

Hæmorrhage.	Vomiting.	Cyanosis.	Struggling, etc.	Stimulants.	Pulse.	Respiration.	After-Effects.
. . . .	. . . .	. . . .	. . . . .	. . . .	Regular and somewhat diminished in force towards the end.	Moderately deep.	No vomiting.
Slight.	. . . .	Some.	. . . . .	. . . .	Of moderate force, regular, and not very rapid.	Deep and regular.	No vomiting.
"	. . . .	Very marked.	Moderate; continuous muscular twitchings.	Ether and strychnine subcutaneous.	At first slow, regular, and forcible; later on more rapid, then again slower, but always of good force.	At beginning very superficial; at end of thirty-five minutes, respiration ceased; tracheotomy; artificial respiration kept up for twenty-five minutes.	Vomited.
. . . .	. . . .	. . . .	. . . . .	. . . .	Rapid, of good force.	Deep and regular.	No vomiting.
Slight.	. . . .	. . . .	. . . . .	. . . .	Slow, of moderate force, not very large.	Rapid and superficial.	
"	Slight retching.	. . . .	. . . . .	. . . .	Weak, regular, rather rapid.	Moderately deep.	Vomited before and after operation excessively.
"	. . . .	. . . .	Slight.	. . . .	Pulse under chloroform became slow and feeble; ether resorted to; then pulse became faster and of better quality and force.	At first superficial; under ether somewhat deeper.	No nausea or vomiting during forty-eight hours after operation; but repeated attacks of vomiting on third day, post-operation.
"	. . . .	. . . .	Considerable.	. . . .	Slow, forcible, and regular.	Deep.	Felt very well; no headache; no vomiting.

ON THE TREATMENT OF THE SAC IN OPERATIONS FOR THE RADICAL CURE OF HERNIA.[1]

By GWILYM G. DAVIS, M.D.,

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THE changes which have recently been suggested and tried for the radical cure of both inguinal and femoral hernias have been so numerous, and have followed each other so quickly, as to compel one to think that the end desired is yet some distance off. As any method of procedure is apt to be merely a temporary one, and as the experience of one individual will hardly suffice to settle disputed matters, it has appeared to me desirable to submit at once for trial a mode of treatment of the sac which I have found to be at least practicable as to its performance, and which may possibly prove acceptable to others. A fundamental question which presents itself in operating for radical cure of hernia is whether the sac shall be utilized or cut away. The most recent operators, as Halstead, Bassini, Marcy, and Barker, following Czerny and Banks, have ligated or sewn shut the neck of the sac and removed it. Others, as Macewen, Packard, and Kocher, have retained the sac as a plug, the first two folding it on itself and placing it external to the peritoneal cavity between the peritoneum and the muscles; the last twisting and suturing it over the line of the inguinal canal.

Ferguson,[2] appreciating, as do those last named, the desirability of retaining the sac, advocates the combining of Macewen's method of treating it with, practically, Halstead's method of closing the canal and disposing of the cord. The use of the sac

[1] Read before the Surgical Section of the Philadelphia College of Physicians, November 6, 1895.

[2] ANNALS OF SURGERY, May, 1895, p. 547.

certainly does afford additional tissue to act as an obstruction to the recurrence of the hernia, and for that reason it should, if possible, be employed, no matter what plans are used to close the muscular and tendinous defects. If the sac is well isolated and drawn down and then ligated or sutured it does firmly close the opening in the peritoneum through which the hernia has come. It also obliterates the infundibuliform process and leaves the interior surface of the peritoneum smooth and free from any marked depression. In this respect ligation of the sac appears to have an advantage over the methods of Kocher and Macewen, in which the peritoneal opening is closed either by carrying the sac first upward and afterwards twisting it, as does the former, or simply folding the sac on itself, as does the latter. The total constriction of the neck of the sac by suture or ligature and retaining it to act as a plug is objectionable, because, having been isolated from the surrounding tissues, its nourishment will be cut off and it may slough or cause disturbance in the healing of the wound, and even if it does heal properly, it is liable to quick atrophy. The following method was devised to avoid these objections: In an inguinal hernia the sac is to be isolated, opened at its extremity, and the contents returned to the abdomen. The index-finger of the left hand is then introduced into the sac until the tip reaches its neck, the end of the sac being grasped by the thumb and remaining fingers. To aid in the further manipulations three hæmostatic forceps are fastened to the abdominal continuation of the sac a short distance away from the finger, one being on each side of the finger and one behind. A curved needle threaded with stout silkworm gut is then passed in and out three times, encircling the neck of the sac, carefully avoiding, as much as is possible, including the blood-vessels of the sac, as high up as it can conveniently be placed, in such a manner as to form a purse-string suture surrounding the neck of the sac. The passing of this suture is guided by the finger within the sac and only half of the circumference of the sac is constricted by the suture; because, as each stitch emerges it skips as much of the sac as was included in the previous stitch. If necessary, the needle may be introduced more than three times. This stage of

the operation is shown in Fig. 1. The finger is now withdrawn from the sac and an assistant makes pressure above the neck to prevent the descent of the intestines. Should the sac be very large, any excess not desired may be cut off. I have retained about ten centimetres (four inches).

The retention of a greater amount increases the liability to sloughing. The distal end of the sac is then transfixed with a needle and stout piece of catgut, the end of which is tied, the remainder being allowed for the present to remain. The extremity of the sac is then grasped with a pair of long forceps, and, while the neck is held by the three hæmostats previously applied, it is

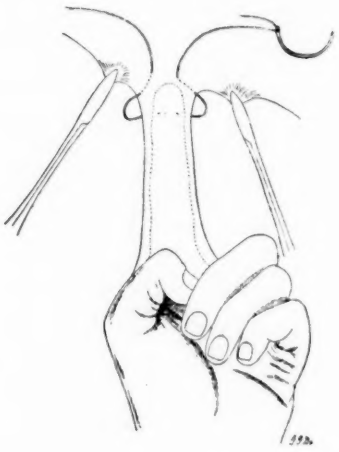

FIGURE 1.

inverted like the finger of a glove, and pushed its full length into the peritoneal cavity. An assistant now ties the silkworm purse-string suture around the neck of the sac and forceps, as shown in Fig. 2. The forceps being withdrawn, the silkworm gut is firmly tied in a reef-knot and the three hæmostats removed. The hanging end of the catgut ligature is now pulled down and fastened by a couple of stitches in the tissues; thus the sac is folded on itself in a mushroom-like form on the interior of the peritoneal cavity, as shown approximately in Fig. 3. The two ends of the purse-string silkworm-gut suture are then threaded with needles and

passed through the muscles above and tied and cut short. The remainder of the operation can be completed by the method of Halstead or any other that may be desired. By this means the folded sac is fixed as a pad on the internal surface of the peritoneum. I do not believe that it will act, as has been held by some, as a wedge to favor the descent of the hernia, but rather as an obstruction to shift the pressure of the gut to some more healthy spot. In order to favor the agglutination of the pad to the abdominal walls, I have scraped the interior of the neck of the sac previous to inverting it, thus promoting the effusion of

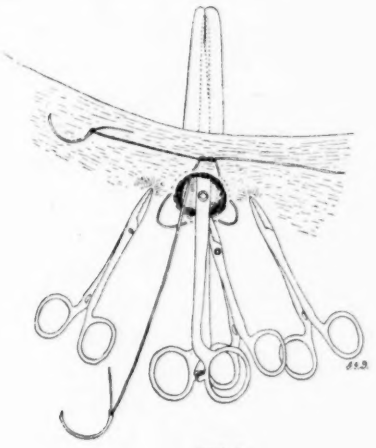

FIGURE II.

FIGURE III.

lymph. It will be observed that the purse-string suture, applied as described, does not constrict the whole circumference of the neck of the sac, but only half of it. Not more than half of the total length of suture is buried, the remaining half of the neck of the sac being left uncompressed, and through it the folded sac is enabled to obtain nourishment. By this means we close the neck of sac as effectually as is done by ligating, and still have as free a field for the closure of the muscles, while we retain such advantages as the use of a pad formed by the sac can give.

In closing the opening in the muscles by Halstead's method, the muscular tissue of the deeper lying transversalis and internal oblique muscles projects upward, and is apt to separate for quite a distance the fibrous expansion of the more superficial external oblique, and it will be an advantage to adopt Bassini's method of suturing the external oblique separately while still retaining Halstead's method of treating the cord.

In operating for femoral hernia, it is still more necessary to preserve the sac than in inguinal. It is almost our only way of offering any effective obstruction to the descent of the gut. In it, also, I have treated the sac as already described, and in addition brought up a flap of pectineus muscle and sutured it to Poupart's ligament, as suggested by Watson Cheyne. This was followed by three buried silkworm-gut sutures which passed through the pectineus muscle, then across the vessels to the deep and superficial structures forming the upper and inner edge of the saphenous opening, and then through Poupart's ligament on which the upper two ones were tied.

The closure of the femoral canal is a somewhat unsatisfactory procedure. The pectineus muscle is so soft and friable as to be almost, if not quite, useless as a means of closure. The fascia covering it in a recent case was so thin as to be practically absent. This leaves almost nothing from which to form a suitable barrier, and our main reliance must, at least until something better is devised, I think, be placed on plugs formed by the hernial sac and simple closure of the canal with a plain circular suture.

The comparative value, in operating for the radical cure of femoral hernia, of the above method and that of Macewen, as elaborated by Cushing, is for the future to decide. The dearth of material wherewith properly and efficiently to close the femoral canal is so great that I would be inclined in future cases to chip off a portion of the adjacent pubic bone and fix it in such a position as to block up the canal. In this it would be aided by the effusion of callus.

The use of kangaroo tendon as a buried suture I am somewhat suspicious of; what has become of it in those cases in which

it has been left buried in the tissues I do not know; but in almost every one in which it has been used for the subcutaneous suture the protruding ends have been found at the expiration of ten days to be almost or quite dissolved from the part remaining in the tissues. This does not speak well for its permanency. Silk, as a deep suture material, I also have not full confidence in, and for the present I pin my faith to silkworm gut with a possible resort to silver wire in case of dire necessity.

AN IMPROVED CLAMP FOR FACILITATING LATERAL ANASTOMOSIS OF INTESTINE.[1]

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THE literature of the present year contains several reiterations of the old advice to make an artificial anus, reserving a secondary operation for the fistula. There can be no good reasons for such miscalled conservatism, in the majority of cases, if competent surgical skill is at hand. Excepting those cases where the patient is already in hopeless collapse, resection with immediate repair is the ideal method; and is to be undertaken if proper surroundings exist. The operation is but little prolonged, and the danger thus added is as nothing compared to that of a second operation to close a fistula, which, if left unclosed, constitutes an infirmity little to be preferred to death. There is abundant testimony that the above is sound surgical teaching, and to establish such a procedure as the only justifiable one, except in extreme cases, is only needed perfection of technique and operative skill. There is no reason to believe suspended peristalsis, from paresis due to long obstruction, overdistention, and fecal absorption, will be any more likely resumed after the formation of a fistula than of an anastomosis. Given a condition of gangrene, after hernia, intussusception, volvulus, or what not, or the presence of multiple wounds from shot or knife in the gut, too close together to permit of suture, or the existence of an inoperable tumor, acute or chronic, resection with immediate repair is the operation.

Whether it is ever worth while to make an anastomosis

[1] Read before the Southern Surgical and Gynæcological Society, at Washington, D. C., November 12, 1895.

around inoperable malignant tumors of the bowel is an undisputed question only when complete acute obstruction supervenes, while the general constitutional powers are still good. These lines, I am convinced, are the ones on which surgery is advancing to-day, and they need no further elaboration. The method of suture is the interesting question. Direct suture, either by the circular method or by anastomosis, is an operation requiring both experience and skill of an unusual degree for a hope of success. Even in experimental surgery the step requires from thirty to sixty minutes in competent hands, and is attended with some 50 to 60 per cent. mortality; but in pathological conditions, with differences in the calibre of the bowel, often added to other complications necessarily attending any condition requiring this operation, circular suture is an unjustifiable step, save in the hands of a master. Lateral anastomosis by direct suture offers but little better prospect. Practically, the rank and file of surgeons either make an artificial anus or use some of the aids.

The mechanical aids are open to several objections which have prevented their general use without exception, save in the case of the Murphy button. In the first place, they make a cumbrous material at the point of anastomosis; in all instances a foreign body of greater or less size must be introduced; without exception the opening is smaller than safety demands; and the security of the approximation is always questionable. The oldest and most widely known of the mechanical devices are the bone plates of Senn. These plates, attractive both in theory and appearance, are bulky in practice, and the opening is limited to not more than an inch and a half, rarely so much. The raw-hide plates which were suggested by Robinson are more manageable, but are most too pliable for security; the potato plates of Dawbarn offer no advantage over the others, save the convenience of manufacture. All of them occasion a very considerable bulk to be introduced into the cavity, and to remain as foreign body in the intestine. The opening cannot be increased in size without not only correspondingly increasing the bulk of the foreign body, but in direct proportion diminishing the security of approximation.

What the button is intended to do it does well; but too

often it does what is not intended, and disaster and death result. There is abundant evidence that it becomes a foreign body; that it occasions necrosis, which advances too far; that recontraction takes place after lateral anastomosis; that fatal results frequently are directly attributable to its use, besides other less important objections. Nevertheless, I believe the button to be so useful, and to have accomplished so much good in overcoming resort to enterostomy, besides saving many lives by preventing bungling direct suture, that I unhesitatingly say that I prefer it as a practical resort to any other method except the one I shall now recommend.

The lateral anastomosis is now beyond all question the most acceptable method of resection of the continuity of the bowel, if we exclude the Murphy button. It is best accomplished by direct suture; and direct suture, as I have before insisted, is of difficult execution except in very skilled hands. In order to facilitate this suture I have already described, a device for clamping opposing surfaces of the bowel, cutting of fenestra between them, and retaining them so opposed until the suture can be completed. I now present an improved instrument for the perfection of which I am greatly indebted to Messrs. W. H. Armstrong & Co., of Indianapolis, for valuable suggestions. It is designed to so simplify and facilitate the operation by direct suture that it can be successfully made by a surgeon of ordinary skill in from fifteen to twenty minutes without risk.

This instrument consists of a clamp with five-inch blades, three-eighths of an inch in width, bearing between them a concealed knife which can be withdrawn four inches. The blades are covered with rubber tubing to protect the bowel from injury by the pressure. A clasp at the end of the handles holds the blades compressed together as in the ordinary artery clamp. The illustration will explain the manner of operation. (Fig. 1.)

When a resection is to be made, the mesentery is first tied off with silk, in two-inch loops, at the margin of the bowel as far as it is intended to remove it. If less than four inches of the gut is to be excised, a V-shaped portion of the mesentery should be taken out to facilitate manipulation of the clamp; otherwise the

mesentery is left intact. An assistant strips up the contents of the bowel with the fingers and holds the flow back six inches out from the point of section. The surgeon cuts through the gut at the point of resection with sharp scissors. Any hæmorrhage from the divided mesentery is checked. The blades of the clamp are now introduced—so as to oppose when tightened the surfaces of the bowel opposite the mesentery—until the free ends of the bowel are received in the curve on the shank of the clamp. The clamp is tightened and two interrupted stitches are inserted on each side near the middle of the blade, to prevent possible eversion of the gut edges after section; the knife is now made to traverse its route two or three times to insure complete section of the gut walls. The pressure made by the clamp con-

FIG. 1.

trols all hæmorrhage. While a second assistant holds the clamp, the surgeon, beginning about one inch from the free end, runs a Glover suture rapidly along the upper surface, interesting only the peritoneal and muscular coats, and thus opposing the one-fourth inch peritoneal surfaces caught by the blades. When the mesentery is reached, depression of the handles will cause the other surface to present at the resected point, and suture of the other side is completed in the same manner. The blades are now unlocked and withdrawn, and the finger of the assistant explores to insure the patency of the fenestra. If for any reason further division is necessary, it is quickly made by introducing a pair of scissors through the open gut end. Such additional cutting will, perhaps, never be necessary, if the knife is passed two or three times along its course. Invagination of the ends is now

done in the usual manner, the cut surfaces of the mesentery sutured as may be necessary, and the anastomosis returned to the abdominal cavity. It can easily be accomplished in from twenty to twenty-five minutes under ordinary circumstances. Practice and skill can do it in less time, and only considerable difficulty can prolong it an hour. (Fig. 2.)

I have experimentally used this clamp sixteen times with fourteen consecutive recoveries. I have had but one opportunity to use it in practice.

On May 25, of this year, I operated upon Mrs. E., aged fifty years, who had a fæcal fistula at the right femoral opening, the result

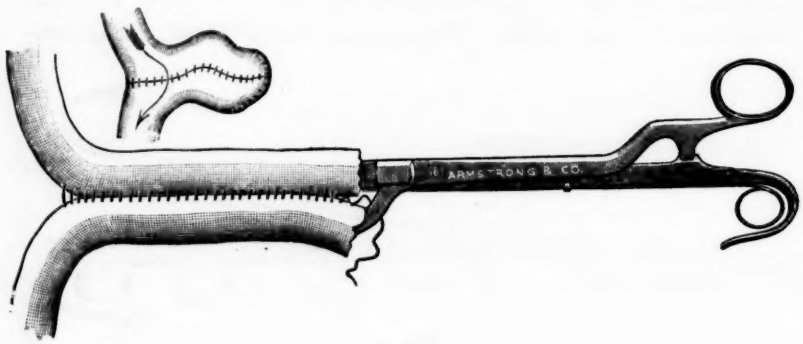

FIG. 2.

of a strangulated hernia, operated on eight months ago. She was in very depressed health, much emaciated, with swollen feet and legs and very feeble circulation.

An incision was made just above Poupart's ligament, near the fistulous opening. The fingers easily liberated in a few moments the intestine, which presented an opening occupying half its lateral surface, about as large as a quarter of a dollar. The mesentery was greatly thickened; the distal segment of the bowel was reduced in size, the proximal dilated at the site of the fistula. About four inches of the intestine were resected; the blades of the clamp were applied opposite the mesenteric borders of each segment, and the anastomosis made as above described. After suturing, Drs. Cartledge and McMurtry examined the communication between the opposing surface and found it ample; the cut ends were then invaginated, and the

anastomosis returned; the abdominal wall closed with the silkworm-gut sutures; the site of the fistula curetted and filled with iodoform gauze, and the patient put back to bed in forty-two minutes.

Notwithstanding her feeble condition she reacted without difficulty. There was very little shock. The pulse never went above 100; the bowels moved on the second day in response to an enema, and she steadily progressed in convalescence. At the present time she is as well as ever, except a ventral hernia at the site of the fistula.

The advantages of this method over the other aids, except the button, are manifest. Not only does it do away with the foreign body, but cuts an opening three or four inches long at the fenestra. It is fully as easily accomplished, and takes, if anything, less time. It is no more difficult to use than is the button, but the operation cannot, of course, be so quickly completed, as the invagination of the ends is not necessary after the end-to-end approximation by the button. The clamp merely makes the direct suture easy to any ordinarily skilled hand, and does away with the foreign body afterwards.

CONGENITAL ABSENCE OF RADII, WITH OPERATION.[1]

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MILDRED G. was born at full term perfectly developed, except that there was complete absence of the radii with abnormal relationship existing in the blood-vessels and soft structures of the forearms.

About this time the ANNALS OF SURGERY for February, 1895, reached me, containing an abstract of Rincheval's paper on "Treatment of Congenital Bone Defects in the Forearm and Leg," in which

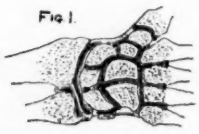

FIG. 1.—Shows a normal wrist-joint with the five synovial sacs.

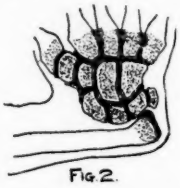

FIG. 2.—Shows the condition existing in the arm of my case.

it was stated that Bardenheuer two years before had presented a new method for the operative treatment of these deformities.

His operation in the forearm consisted in replacing the defect at least at its lower part with bone, and thereby permanently correcting the deformed position of the hand.

The operation is performed as follows: by a longitudinal incision the distal end of the ulna and the carpus are exposed, and the first

[1] Read before the American Orthopædic Association, Chicago, September 17, 1895.

isolated from its attachments. The ulna is then split through its middle into a radial and an ulnar section. These are separated by allowing the carpal bones to come up between them. By means of a nail through each side the ends are fixed to the carpus. A plaster bandage is applied, and left on four or five weeks.

"This operation is easily carried out. It had been done three times by Bardenheuer, twice for congenital absence of the radius in an eighteen-months-old child and in a seven-weeks-old baby, and once in a ten-year-old boy, whose radius had been removed at its lower part for caries, leaving the hand in a position of varus.

"The results in all three cases were good, both from a functional and cosmetic point of view. In all cases the deformity was permanently corrected. The movability of the hand was almost normal. There was no disturbance in the longitudinal growth of the bone. In the first case operated upon there was a very pronounced growth of the deformed extremity a year after the operation.

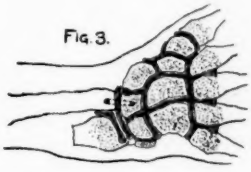

FIG. 3.—Shows the relationship of the parts after operation.

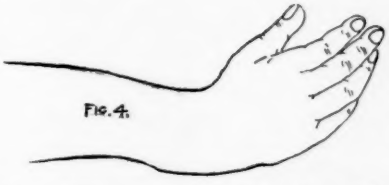

FIG. 4.—Shows an outline drawing of the arm as furnished me by the family physician six weeks after operation.

"The same principles may be adopted in the treatment of other defects. In cases of congenital defects of the tibia or fibula the same operation has been done once in each. The best result was obtained in the fibular defect."

March 1, 1895, when the babe was five months old, it was operated upon at the Protestant Hospital, Columbus, O., the desire being to adhere to the method described as nearly as possible. It was not possible, however, to follow the method.

The soft structures, tendons, etc., were so much shortened that to attempt to shift the end of the ulna across to the centre of the carpus would have been impossible except by a virtual amputation of the arm. To have split the ulna and wire the carpal bones between these ends would have been impossible.

The only method that appeared to me to be possible was to sever

the ulna at a point where the free end of the upper fragment could be brought to the semilunar.

The semilunar was curetted and drilled, and after drilling the ulna these bones were adjusted with silkworm gut. It was necessary to tenotomize the tendons, etc, upon the radial side of the forearm before the hand could be straightened. A number of arteries were severed and required ligation. The incision through the soft tissues was made obliquely across the forearm, beginning upon the dorsum of the wrist upward and around under the forearm, the object being to allow the structures to slide upon each other, and then be sutured in the corrected position, thus avoiding the gap that could be otherwise left

FIG. 5.—Shows photograph of child before operation.

after a cross-section. After dressings were applied the hand was put up in plaster of Paris. There was quite extensive hæmorrhage, and it was necessary to redress the arm in twenty-four hours. The next dressing was made in two weeks after the operation and primary healing had occurred.

The operation was done on the left hand, and a second operation was planned for the right arm, but the patient died with pulmonary tuberculosis five months afterwards.

Such an operation would, of course, destroy the second sac of the wrist-joint, and, assuming that the third synovial sac

was normal, the wiring of the free end of the ulnar to the semilunar would not destroy the third sac, and to wire with the hope of union between these bones would allow fair flexion and extension at the wrist.

Kronig[1] quotes as follows: "There are forty-five recorded cases of congenital absence of the radius, and in twenty-one the defect was bilateral. In only two were the thumb and metacarpal bone well developed. In the great majority of cases the child was both premature and stillborn, and it seldom lived many weeks. Nearly always other defects were present in other parts of the body."

In this country Dr. R. H. Sayre reports one case, Dr. A. E. Taylor, of Philadelphia, has given me a report of one case by letter.

[1] British Medical Journal, March 10, 1894.

STRETCHING OF THE LINGUAL BRANCH OF THE FIFTH NERVE FOR THE RELIEF OF NEURALGIA OF THE TONGUE.

By J. F. WALSH, M.D.,

OF CAMDEN, N. J.

KATE R., aged twenty-six years, white, unmarried, was admitted to Cooper Hospital, Camden, March 10, 1888, with the history that five years before she suddenly experienced a sharp shooting pain on the right side of her tongue, while washing her face with cold water. This pain reappeared at intervals of about two weeks thereafter, at first, and then gradually increased in frequency until there occurred several attacks every week. The pain was especially severe for three days previous to each menstrual flow, gradually lessening as the latter disappeared. For the last three years the neuralgia had been almost constant, with occasional exacerbations. Her mother was of a neurotic temperament.

I saw the patient, for the first time, about eight months previous to her admission into the hospital. The tongue presented no unusual appearance. Anterior portion of the dorsum, on the right side, sensitive to pressure; to this area she referred most of the pain. Sensitiveness over the trunk of the right lingual nerve. I treated her by local applications of a 10-per-cent. solution of cocaine hydrochlorate, and by a mild galvanic current, one pole applied over the trunk of the nerve and the other run over the dorsum of the tongue,—the current being reversed at short intervals. Internally she took the usual antineuralgic medicines. Under this treatment she showed considerable improvement for a time, but finally relapsed into her former condition.

March 14, 1888. Operation: in the presence of Professor W. W. Keen, of Philadelphia, and Dr. Alexander McAlister, of Camden. Patient etherized, and mouth well sponged with soapy water, and then with a carbolic solution. The tongue, by means of a sharp hook

fastened into its tip, was drawn well forward and to the left side, and held in that position. I made an incision along the lower third of the side of the tongue, commencing far back at the root and extending forward about an inch. The nerve was readily exposed and dissected out of its bed with the handle of the scalpel. A weight of four pounds was applied for five minutes, the point of application being posterior to the origin of the filaments supplying the submaxillary ganglion. The nerve was then replaced and the wound closed with shotted wire. Dr. O. B. Gross assisted me. There was not much soreness following the operation. The neuralgic pain ceased entirely for three days. On the 17th it reappeared with great intensity. It continued with varying severity until the 20th, when I again operated.

March 20. The wound was reopened. A weight of eight pounds was applied to the same portion of the nerve as on the previous occasion. It was allowed to remain for two minutes when it was reduced to four pounds, which was used for three minutes longer. The fibres of the nerve show evidences of the tension. The wound was not closed with sutures, as they had not held in the first instance.

There was considerable soreness of the tongue and slight increase of salivation for a few days after. The neuralgic pain ceased entirely, and the patient slept well. She was kept on soft diet for twelve days, when the wound had completely healed, and all soreness in the tongue had left. She was discharged from the hospital on April 15. No recurrence of neuralgia.

Up to the present writing (1895) she has been free from pain.

Thirteen days after the second operation the following notes were made.[1] They may be interesting as affording some light on the anatomical distribution of the gustatory nerve and on its function.

April 3. The tongue presented the appearance shown in Fig. 1. The right half was rounded and rather flabby, while the left showed an indentation along its side. The median line of the tongue was pushed over in an arched manner towards the right side. This condition was, no doubt, due to a loss of the proper balance of muscular power between the two lateral halves of the organ; the muscular tissue of the right half being weakened, the fibres of the left found less resistance at the median line, and consequently bent over. The movements of the tongue were clumsy.

[1] These experiments were repeated on several occasions previhus to patient's discharge from the hospital.

Motor Test.—A faradic current, with the poles placed on the substance of the lingual muscle on the right side, produced less contraction than when the current was applied on the left side, and when one pole (the positive) was held over the trunk of the lingual nerve at the point of operation and the other over the body of the muscle, the contraction was still less.

Sensibility Test.—Over the whole surface of about the anterior three-fourths of the dorsum and side and of the under portion of the right half of the tongue I could detect no sensibility. (See Fig. 2, No. 2.) I used the æsthesiometer. The electric current, also, furnished no

FIG. 1.—No. 1, Area of diminished sensibility and sense of taste.

sensation. The tip of the tongue, however, must be excepted; here there was considerable sensibility. (See Fig. 1, No. 1, and Fig. 2, No. 3.) At the posterior fourth of the base and side the patient said she could feel the pressure of the instrument, but the feeling was not as acute as over the corresponding area of the opposite side. (See Fig. 2, No. 1.)

Taste Test.—A mixture of one-half water and one-half pure acetic acid was used. It was applied by means of a glass rod. Over the anterior three-fourths of the dorsum and side of the right half of

the tongue the sense of taste was lost; over the posterior one-fourth it was scarcely perceptible. (See Fig. 2, Nos. 1 and 2.) When, however, the acid was put directly on a circumvallate papilla the taste seemed quite active. At the tip (see Fig. 1, No. 1, and Fig. 2, No. 3) there was but slight loss of function. The under surface was devoid of taste.

April 15. The patient was discharged from the hospital. There had been no recurrence of neuralgia. The tongue appeared to be regaining its energy. Between this date and the present writing I lost sight of her. A recent report from her states that she now suffers no inconvenience or pain.

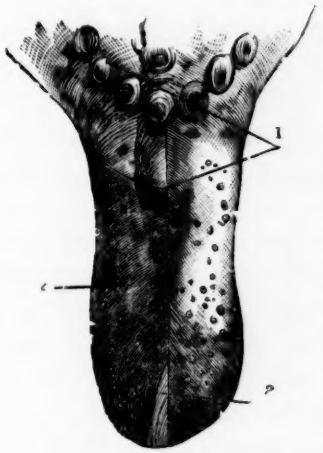

FIG. 2.—No. 1, Area of diminished sensibility. No. 2, Area of absolute loss of sensibility and sense of taste. No. 3, Area of diminished sensibility and taste.

Anatomists differ considerably in their descriptions of the distribution to the tongue of the hypoglossal, pharyngeal, and gustatory nerves; and also with regard to the functions of these nerves.

The *hypoglossal nerve* is generally conceded to be the sole source of motor power. But some authors ascribe to the gustatory a partial distribution to the muscular fibres of the tongue; and Flower[1] describes the latter nerve as alone supplying the lingual muscle.

[1] Diagrams of the Nerves.

The *gustatory* or *lingual nerve* is variously described as distributed to the conical and fungiform papillæ of the tongue; to the conical and fungiform papillæ and to the mucous membrane or the anterior two-thirds of the side and dorsum of the tongue; to the simple papillæ on the dorsum and tip of the tongue; to the numerous papillæ of the tongue; to the upper surface of the tongue, especially at its tip; to the anterior two-thirds of the tongue; to the mucous membrane of the mouth and the papillæ at the sides and the tip of the tongue. Gray[1] says, "It is much better to call this the lingual nerve. It is certainly distributed to the tongue, but its function as to taste is dubious." Milne-Edwards[2] says that "the lingual branch of the fifth pair is the special nerve of taste." Bell[3] states that when "the lingual is injured the sense of taste is lost; when the hypoglossal is injured, motion of the tongue is lost, but taste remains."

The *glosso-pharyngeal nerve* is described as being distributed to the mucous membrane of the base and sides of the tongue; or to the mucous membrane and papillæ of the base and sides of the tongue; or to the mucous membrane of the dorsum of the tongue behind the foramen cæcum and to the circumvallate papillæ and to the mucous membrane covering the lateral parts of the tongue and to its muscular structure; or to the mucous membrane and papillæ of the base of the tongue; or to the circumvallate papillæ; or to the base of the tongue; or to the mucous membrane of the base and sides of the tongue and to the circumvallate papillæ; or to the mucous membrane of the back of the tongue and to the muscular structure; or to the mucous membrane of the base of the tongue by one branch, and to the mucous membrane and papillæ of the side of the tongue by another; or to the muscular structure of the tongue. Gray[4] says it is the special nerve of taste. Bell,[5] that it is a nerve of deglutition; Milne-Edwards,[6] that it is a motor nerve; Wilson,[7]

[1] Gray's Anatomy, edited by W. W. Keen, 1887.
[2] Outlines of Anatomy and Physiology, 1841.
[3] Anatomy and Physiology of the Human Body, 1834.
[4] Op. cit.
[5] Op. cit.
[6] Op. cit.
[7] System of Human Anatomy, 1880.

that it endows the circumvallate papillæ and the back part of the tongue with taste; Ellis,[1] that it furnishes taste to the back part of the tongue and to the pillars of the fauces.

From the observations made in the case I have reported I should deduce that the lingual branch of the fifth pair is largely concerned in furnishing taste and sensation to the tongue, and that it partially supplies the lingualis muscle with motor power, the motor filaments in its composition, in all probability coming from the branch which it receives from the chorda tympani nerve; and possibly, some of them may be derived from the anastomosing branches with the hypoglossal nerve. As to the small area at the tip of the tongue on the injured side where sensation and taste were not entirely lost I conclude that there is here a commingling of the terminal filaments of the two lingual nerves, or else that the hypoglossal in its anastomosis with the lingual at the tip of the tongue brings here the filaments which it has received from the latter previous to its entering the tongue. With regard to the glosso-pharyngeal nerve I should say that it assists in furnishing sensation to the posterior fourth of the tongue, and alone supplies the circumvallate papillæ with taste.

In addition I offer the following suggestions: The filiform or conical papillæ of the tongue are solely concerned in endowing this organ with the delicate tactile sense which it possesses; the intervening mucous membrane has only ordinary sensibility. To the fungiform and circumvallate papillæ belong the sense of taste. The filiform and fungiform papillæ are supplied entirely by the gustatory nerve, while the glosso-pharyngeal is alone distributed to the circumvallate. The intervening mucous membrane is supplied by the gustatory for about its anterior three-fourths; by the glosso-pharyngeal for the remainder of its surface.

[1] Demonstrations of Anatomy, 1879.

ENTERORRHAPHY WITH MURPHY'S BUTTON FOR GUNSHOT PERFORATION OF INTESTINE; RECOVERY.

By JAMES W. WALKER, M.D.,

OF CHICAGO,

HOUSE SURGEON, COOK COUNTY HOSPITAL.

MISS O. C., aged twenty-eight years, was admitted to the service of Dr. Carl Beck, in the Cook County Hospital, Chicago, at 11.15 P.M., September 6, 1895, having been shot in the abdomen about two hours before admission. Patient laid in dorsal decubitus, with both legs flexed, and complained of diffuse abdominal pain, with great tenderness on pressure. She stated that she stood face to face with her assailant when she was shot. The calibre of the weapon she did not know. Examination revealed a small circular wound of the abdominal wall two and a half inches below the level of the umbilicus, and three inches to the left of the median line. Patient's skin was warm and dry, and there were no local or constitutional signs of hæmorrhage. Under chloroform anæsthesia a vertical incision, three inches in length, was made over the site of the wound, and a careful dissection of the abdominal wall led to a perforation of the peritoneum. The panniculus adiposus was excessive. The intestine was then withdrawn for examination loop by loop. A Meckel diverticulum was found, and beyond this it was possible to draw out only two feet of intestine. The location of this structure being usually about a metre above the ileo-cæcal valve, it was assumed that the lower part of the ileum was being handled. The search was then prosecuted in the opposite direction. In the upper part of the ileum a double perforation was found, the bullet having passed transversely through the intestine. The wounds were about one centimetre in diameter. A resection of two inches of the intestine was made, an end-to-end anastomosis secured by means of

a No. 4 Murphy button, and the mesentery ligated with No. 4 silk. Sterile water was poured over the loop of intestine. About ten inches higher a single perforation was met, which was closed laterally with Lembert sutures of silk, an area of contusion adjoining the wound being included in the line of suture. The unavoidable constriction caused by this suture might have caused me some anxiety about the safe passage of the Murphy button, had not the presence of the Meckel diverticulum indicated that the anastomosis wound was the lower of the two. The abdominal wound was closed with a single row of No. 10 silk sutures, and a long glass drainage-tube inserted to take care of the bloody serum in the peritoneal cavity, which was considerable in amount. The peritoneal cavity was not irrigated.

At the close of the operation the patient's temperature was 101° F.; pulse 124. During the night two doses of morphine sulphate, quarter of a grain, were given, and one on each of the three succeeding evenings. The temperature was 90° F. axilla, pulse 128, twenty-four hours after operation, and 99° F. axilla, pulse 128, forty-eight hours after. From this time the pulse slowed down, but a temperature of about 100° F. continued for several days, doubtless due to the absorption of blood and serum by the peritoneum. There was occasional vomiting during the first three days. During the first thirty-six hours, copious dressings became saturated in a few hours. The drainage-tube was removed in forty-eight hours. A successful rectal injection was given twenty-four hours after the operation, and repeated each alternate day for nine days, when calomel was administered in repeated small doses. The sutures were removed on the tenth day. The Murphy button was passed on the fifteenth day.

The bullet was not found. Painful locomotion of a few days' duration, referred to the lumbar region, led me to think that the bullet might have lodged in the psoas muscle.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, October 23, 1895.

The President, ROBERT ABBE, M.D., in the Chair.

BILHARZIA HÆMATOBIUM.

DR. B. FARQUHAR CURTIS presented a case of this disease, seen so rarely in America. Bilharz discovered the parasite in 1851. It is found in men and monkeys in Egypt, the Cape Colony, and South America. The parasite is supposed to enter with the food or drink, or even by the superficial veins, urethra, or rectum while bathing. Women are rarely attacked, perhaps because they do not bathe so much; boys are attacked most frequently. The male parasite is one-half an inch long, the size of the oxyuris, the female is three-fourths of an inch long and of the size of a fine silk thread. Adults are found in the portal vein and its branches—splenic and vesical—and cause no symptoms. After fecundation the female enters a small vein, lays immense numbers of eggs, and bursts the vessel. The eggs are found in the bladder, ureters, vesiculæ seminales, mesenteric glands, and rectum,—rarely in the liver, kidney, prostate, lung, and heart. They pass with the urine and fæces. They cause hæmorrhage with induration of tissues, polypoid vegetation, and ulceration. The greatest changes usually occur in the bladder, and calculi and even neoplasms sometimes result.

Symptoms may appear in four months,—hæmaturia, renal colic, irritable bladder, mucus in urine, even pus. Cystitis and pyo-nephrosis follow. The symptoms may cease spontaneously, or cause death. They may last for many years,—ova found after blood ceases to appear in the urine. There is no treatment except to meet indications as they arise.

The following was Dr. Curtis's case: C. E., aged twenty-nine years; Scotch; male; unmarried. Entered the hospital September 29,

1893. He had served in the English army in Egypt for four years, 1883–86. Family history good; negative as to stone. Personal history good. Gonorrhœa eight years ago in Cairo, from which he recovered without injections in one month. Two years and a half ago he had quite severe tertian intermittent fever for two months, being cured by quinine. Soon afterwards he first noticed blood in the urine—without pain or tenesmus—more or less constant for two years. Last July there had been no blood in the urine for one month or more. September 11, the urine was examined for life insurance. It contained no blood or albumen, but the next day blood reappeared. Since then there had been more blood than usual, along with clots. Urination varied in frequency, some days seven or eight times, others every fifteen minutes. Tenesmus was present. Urine acid, specific gravity 1021; contained pus and blood. The prostate was normal. Both seminal vesicles rather large. The bladder was unequally distended, appearing fuller on the left side. No calculus was detected with the Thomson searcher, but there was marked "water-hammer," interruption of flow even when the bladder was distended. Examination was not painful, and did not excite hæmorrhage. A fragment of clot or tissue caught in the catheter and on examination gave negative indications. No fever.

October 3, the urine was acid, specific gravity 1020, small amount of albumen, no sugar, red blood-cells, and pus were present. October 4, cystoscopic examination by Dr. William K. Otis, who found a flat tumor near the right ureteral orifice. October 7, examination under ether, Trendelenburg posture, sound in the bladder and finger in the rectum; result negative. The Peterson bag was used in the rectum, with eight ounces of water in the bladder, suprapubic section was made, and a nodular infiltration was found two inches in diameter, not very hard, nor much elevated, the tissue under the electric light looking like granulation-tissue or sarcoma. It was the same tumor which Dr. Otis had seen, situated near the right ureteral orifice. The mucous membrane was cut away over the whole area, removing the tumor, the muscle beneath appearing normal. The ureteral orifice was slit up to prevent obliteration by contraction. The hæmorrhage was slight. The rectal bag was removed, the bladder was lightly packed with iodoform gauze, and a drainage-tube was inserted to the base. The wound was left open. The patient suffered considerably with colicky pain during the healing of the wound. The patient began to pass water by the penis on November 3, and on November 14 no more urine escaped from the suprapubic wound.

During six to eight months after leaving the hospital the patient was attacked every three or four weeks with fever, and severe renal colic on the right side, passing off with a large amount of clear gelatinous mucus in the urine, never any blood. These at first disabled him so much that the advisability of nephrotomy was discussed. The attacks, however, became gradually less severe and less frequent, and there was none from February to August, 1895. In August he had one, and another recently, in October.

Dr. Curtis said the diagnosis of Bilharzia hæmatobium was first made in this case by the microscopic examination of the tissue. So far as he knew it was the first time the local lesion of the disease, aside from extraction of calculi, or cystotomy performed for drainage, had been dealt with surgically, and while the treatment was adopted under a mistaken diagnosis, he thought the result showed that it was correct. The patient had been restored to good health, although it was impossible to say whether some of the parasites were not still in his system.

In answer to inquiries, Dr. Curtis stated that the parasite did not develop in the human body. There was at least one pair. As they were usually in the renal or mesenteric veins, it was not unlikely they were still present in this case. He believed that, as a rule, they were not very numerous. The symptoms were produced by the countless number of eggs which they threw off. These could not develop in the human body, but had to pass into some other host. What that host was he believed was still undetermined. This patient had evidently had a light attack, possibly his body had been infested by only a single pair of the parasite, and that this pair had died, so that he was suffering only from the mechanical influence of the eggs.

FACIAL NEURALGIA CURED BY EXCISION OF THE GASSERIAN GANGLION.

Dr. A. G. Gerster presented a young woman whom he had shown to the Society a little less than a year previous, along with another case illustrating the result of excision of the second and third branches of the fifth pair of nerves for neuralgia. The excision of the second branch was done by Lossen's method, November 3, 1894. She was then thirty-three years old, and had been suffering six years. In July of the present year she had returned, the neuralgia being even of more violent type, and she urgently demanded that something be

done. The operation was done on July 27, according to the method of Krause and Hartley. The skull was opened by an incision above the zygoma, a portion of the skull was turned down, the dura was raised from the base, the site of the oval foramen was exposed, the third branch of the nerve was grasped and divided, the second branch was followed up to the foramen rotundum and was found to be attenuated to a mere thread. It, too, was divided, and then both stumps being firmly grasped the ganglion was evulsed. The first branch was not divided owing to the danger of hæmorrhage from the cavernous sinus.

The operation was very easy, but the case showed what he had contended for, that the conformation of the skull, the depth of the sulci, and the adhesion of the dura to the inner surface of the skull would determine whether it was to be an easy or a difficult operation. No untoward consequences followed. A fillet of iodoform gauze was introduced into the posterior angle of the wound for drainage. There was very little elevation of temperature. First the patient complained of much headache. On the fifth day the drain was withdrawn, and then a considerable quantity of clear yellow serum escaped, which he believed was the main cause of the headache. He believed that in these cases it was best not to use capillary drainage, but to drain in the old-fashioned way, with a tube, in order to permit free escape of the first discharges. The wound had healed by August 23, when the patient was discharged cured. The neuralgia disappeared promptly, the flap had healed firmly, and the patient was able to return to her daily work. Sensitiveness had not returned over the second and third branches, except that there was returning sensation along the lower eyelid. He was unable to explain this. In a number of cases sensation had returned after a longer or shorter period, but the results of this operation were much better than those of any other.

Dr. Gerster said he had not found the chisels recommended by Hartley to be very good ones. He thought the time required for opening the skull with them was unduly long. Dr. Gerster had seen no ill effects from the blows upon the skull with chisel and mallet in the many cases operated upon by him, unless it were in one instance in which every time he made three or four blows with the mallet, and not very hard blows either, the patient's pulse would immediately drop and become extremely slow and weak. That, however, was only at the beginning of the operation. Towards its conclusion the mallet could be used vigorously without such effects. It could hardly

be regarded as conclusive that the blows of the mallet affected the heart in this manner by its influence upon the central nervous system. But he thought dissecting out so large a flap, taking so much time, operating in a narrow groove which became filled with oozing blood, and the danger of penetrating the dura, constituted strong objections to the grooved chisel. He had lately seen Dr. Kammerer use a circular saw, invented by Krause, with which, in dexterous hands, the opening could be made very quickly. He thought this was likely to prove an ideal tool for opening the skull in these cases.

DR. ABBE said he had had occasion to do the Hartley operation two or three times, twice in old women. The last patient, a woman sixty-five years old, a sufferer from tic douloureux for ten years, almost incessant spasm, had not slept in bed for six weeks past but had got snatches of sleep in her chair, was operated upon nine days ago, with the result thus far of complete relief. He used the Hartley chisel with the greatest satisfaction, taking only nineteen minutes to reach the depth of the groove. It was necessary to pack the wound on account of hæmorrhage, removing the packing at the end of twenty-four hours. The anæsthesia in the inferior branch was apparently complete, but the patient had slight sensation in the middle and superior branches. She knew when one touched the scalp.

In the case of the other, a woman of fifty-five years, on whom he first performed Salzer's operation, two years ago, while section of the nerve was perfect, yet recurrence took place after a few weeks, and he resorted, in January last, to intradural section by Hartley's method. There was entire freedom from pain for three months, when the patient died from some other cause. In the last case he did not curette the ganglion, yet all spasm in the first nerve disappeared as soon as he tore out the second and third branches, and the inference was that in this act the filaments of the first branch were also severed. In the other case he curetted the ganglion with the sharp spoon, and with great satisfaction, for there was little hæmorrhage, and the patient was quite relieved.

DR. CHARLES K. BRIDDON asked Dr. Gerster what he did with the first division when it was involved in the neuralgia? Recently reading of some operations done by a distinguished surgeon of this State, in which the operator expressed the belief that it was impossible to separate the ganglion from the dura with the knife, Dr. Briddon had instituted some experiments on the cadaver. Lifting the dura from the fossa exposed the ganglion without trouble; section of the

second and third divisions at their exit through the foramen rotundum and ovale, and forcible backward traction of those nerves, separated the first division and lifted the entire ganglion from its bed; there was not the slightest trouble in doing this, but of course the cavernous sinus was exposed, and as its lining membrane is extremely thin, in all probability it would nearly always be opened, and in the living subject the assistant's finger would have to follow up the separation of the ganglion, so as to temporarily arrest the unavoidable hæmorrhage from the sinus.

Dr. Willy Meyer said he had done this operation once, and in that instance had used Dr. Hartley's tools, which he had found convenient. He believed he had taken somewhat more time than that mentioned by Dr. Abbe. He had not timed himself, however. He was of opinion that the operation could be done more quickly with the saw spoken of by Dr. Gerster. In his case only the second and third branches were involved. He divided them at the foramen ovale and foramen rotundum respectively, and pushed the distal end through the foramen under the base of the skull as proposed by Dr. Hartley. In cutting the nerve at the foramen rotundum there was hæmorrhage, for which he was obliged to use a gauze tampon. Forty-eight hours later the skin-muscle-bone-flap was stitched in place with catgut sutures. He thought he made a mistake in closing the skull without providing for drainage. Some suppuration in almost every one of the stitch-canals took place, with slight elevation of the temperature, yet the patient made a good recovery. This was the latter part of May. He was discharged in the middle of July. The man came back again the beginning of August, complaining of severe headache on one side. Suddenly there was rise of temperature, with slight chill, which could not be accounted for except on the assumption that there was abscess of the brain. But the most careful clinical observation did not reveal any signs of cerebral abscess. Dr. Meyer was about to explore for pus, but that day the temperature suddenly fell and remained normal. On returning to his room after a walk in the hospital grounds at about the end of August, the man suddenly fell dead. Post-mortem examination showed death to be due to a large abscess in the temporal lobe on the same side as the operation. Dr. Meyer thinks that the catgut-stitch abscesses secondarily caused the brain-abscess and that the patient might have been cured by an operation.

This patient had no more pain whatever after the operation, but

two months and a half afterwards he could feel more or less distinctly over the entire cheek.

DR. GEORGE WOOLSEY said he had always found the wood-carver's tools sufficient in operations on the skull. In one case the skull was three-quarters to seven-eighths of an inch thick, yet it delayed the operation but little.

DR. GERSTER thought it no more than proper and just that he should bring to the notice of the members the fact that during the summer he had published a fatal case of this operation which had occurred in his service at the German Hospital during the spring. Post mortem verified the diagnosis of circumscribed encephalitis, which was found at that part of the temporo-sphenoidal lobe over which Hartley's retractor had been applied. Undoubtedly the brain had been bruised and hæmorrhage had taken place, causing an extensive encephalitis of which the patient died on the twelfth day.

EXPERIMENTS ON THE COCAINIZATION OF THE NASAL MUCOUS MEMBRANE BEFORE AND DURING SURGICAL ANÆSTHESIA.

DR. ARPAD G. GERSTER read a paper on this subject, see p. 1.

DR. JOSEPH D. BRYANT recalled a case in which chloroform was being given to a boy, seven or eight years of age, and alarming symptoms occurred while, he imagined, the one administering the chloroform was paying more attention to the operation than to the anæsthetic. That patient came near dying. He was able to recall another case in which death took place from the administration of ether by himself many years ago for reduction of a dislocated hip, the patient having Bright's disease.

While his own experience had been such as in nowise to lead him to fear anæsthetics, he wished to speak a word of caution against the careless way in which they were commonly administered in hospitals. If there was anything which would impress one that there was small danger in giving ether, it was to witness the usual method of giving it by the hospital interne. He had become more convinced the longer he had watched the employment of anæsthetics in hospitals that not infrequently the administration of these agents was of graver import to the patient than the operation itself. He thought it was important to direct attention to the necessity for greater care in the giving of anæsthetics.

Regarding the use of cocaine, Dr. Bryant had had but one unfavorable experience, and it occurred during its use by hypodermic injection prior to opening an abscess. Symptoms similar to those described by Dr. Gerster, of cocaine-poisoning, developed. He must say that he could not recall as many unfavorable results from the use of anæsthetics as Dr. Gerster had reported, but this might be due to want of full records of all his cases. If cocaine were used as described in the paper it would do away with the feeling of suffocation which the patient experienced when taking ether alone; and if it would prevent subsequent nausea and vomiting, it would be of great advantage. It was a serious question, however, whether these advantages were not more than counterbalanced by the unusual symptoms which had arisen in a number of the cases reported to-night by Dr. Gerster.

Dr. Willy Meyer said he thought that every surgeon who was constantly using ether and chloroform would have occasion to hail Dr. Rosenberg's treatise with delight. In former years he had employed chloroform almost exclusively in his practice. In 1889 he had one death with it in his hospital practice, with annoying personal after-occurrences. This experience and a similar one of his colleagues at the German Hospital led the medical board to do away with chloroform nearly altogether in the hospital. Later they were given permission to use such anæsthetics as they thought best.

Since reading Rosenberg's paper, Dr. Meyer had at once employed cocaine in the manner described in all of his cases occurring in private practice (not having been in hospital practice before September 1), having, as formerly, always the same doctor to give the anæsthetic. Instead, however, of using a 10-per-cent. solution of cocaine, he used a 5-per-cent. solution. This was applied about ten minutes before the operation, and at intervals of about twenty minutes during the operation. In all the cases the amount of chloroform required had been very small compared with his former experience. The drop-method had been strictly adhered to. In all cases the stage of excitement was easier in every respect, vomiting occurred during narcosis only once, and there had been no disagreeable after-effects. He must say that he would not, after this experience, like to employ any form of narcosis, especially chloroform narcosis, without accompanying it with the cocaine spray.

But symptoms of cocaine-poisoning had occurred now and then, as stated by Dr. Gerster, and in this connection the question arose as

to how much cocaine had been sprayed into the nostrils. Sometimes the instrument blew in but a small amount of the spray, sometimes a large amount. This emphasized the necessity for adhering to the proposition of Rosenberg, to use only a graduated spray, always using so much and no more of the solution. It was interesting to know that chloroform and cocaine were mutual antidotes.

DR. ABBE said that while personally he had had no experience with this combination of anæsthetics, yet from what he had seen and heard of nasal cocainization, with its frequent production of syncope, especially when used in strong solution, he felt that it was adding an element of danger to an anæsthetic—ether or chloroform—to which little danger rightfully belonged. In the hands of the public this danger was likely sooner or later to prove serious. For his own part, he would be loath to inject a 10-per-cent. solution of cocaine into the nostrils. He had seen syncope from the use of cocaine in one or two cases in such degree that it would have proved easily fatal had there been added to it the risks of other anæsthetics, as proposed. It seemed to him that ordinarily in 100 anæsthetizations in hospital practice, one would not meet with four or five grave emergencies, such as Dr. Gerster had described where cocaine was also employed. Out of 500 cases of anæsthesia in a year, he would not, he thought, see more than one in which it would be necessary to resort to artificial respiration. About twenty minutes should be taken always for inducing ether anæsthesia, the first five of which the cone should be held away from the nose and mouth, and air be allowed to mix freely with the vapor of ether, thus producing, primarily, anæsthesia of the nasal and laryngeal mucous membranes, and avoiding irritation, cough, and fright. The patient thus passed quietly into the stage of complete etherization. He must confess that the reports of others had not encouraged him to use cocaine in combination with ether.

DR. HOTCHKISS said he had seen ether and cocaine used in the same case only on one occasion. This was a case of floating cartilage in the knee, in which an attempt was made at removal under local anæsthesia with cocaine. As the loose body was not easily reached, the ether cone was placed over the patient's nose and mouth, but it soon had to be removed on account of alarming symptoms of cocaine-poisoning manifesting themselves. Artificial respiration was resorted to, and had to be renewed every time the ether cone was put on the face. Finally, the operation was given up entirely.

DR. GERSTER said that chloroform had been used in the case in

which it was necessary to resort to tracheotomy. He further rejoined that his intention in presenting the paper had been to call the attention of the members to an attempt to improve upon a procedure which everybody recognized to be very defective. The gentlemen might say what they pleased about the pleasantness of ether anæsthesia, but for his own part he regarded it as one of the most unpleasant experiences which patients were compelled to undergo, as it was usually carried out. Not to attempt to improve upon the usual method of inducing anæsthesia was simply to blind ourselves to the sufferings of the human beings who placed themselves under our charge. Being choked into insensibility is certainly very unattractive. Anything which would do away with even a fraction of this suffering deserved consideration, and we should not allow ourselves to become brutalized and indifferent to suffering simply because we saw it every day. *A priori* conclusions did not amount to anything. He would beg the members to try this method, as he had done, and after having gathered experience with it, get up and tell just what it was. He was sure it could be conscientiously employed by every surgeon. With regard to the criticisms which had been offered, he thought vague general statements or expressions of mere belief were not sufficient. A full record of one's experience was necessary, especially of our disagreeable experiences during anæsthesia. He had himself mentioned four cases in which serious symptoms were observed in the course of anæsthesia, yet he could conscientiously say that two of them ought to be excluded, for in them the combination of cocaine with ether or chloroform anæsthesia had absolutely nothing to do with the patient's collapse. The collapse was due entirely to excessive loss of blood, and to nothing else. The third case was the only one in which the cocaine could, perhaps, be charged with the causation of the unpleasant symptoms, but it was not conclusive. In the fourth case the method was a failure because of spasm of the glottis, but it was not right to attribute this to cocaine, as he had seen it occur where cocaine was not used.

Mere recollection amounts to but little in dealing with facts of this kind. Unless they were written down at the time of their occurrence, as in the hundred cases which he had now reported, they will escape one's memory within a few weeks, in the active, exciting, and often dramatic work of the surgeon.

OTITIS MEDIA; AURAL HÆMORRHAGE; CEREBRAL ABSCESS.

DR. ABBE presented a specimen and related the history of the case as follows: A child, two years and a half old, poorly nourished, with purulent otorrhœa and a healed sinus in the middle of the mastoid, was brought into his service at the Babies' Wards of the Post-Graduate Hospital. The temperature was about 101.5° F. The child had had the otorrhœa about a year, without knowledge on the part of the parents that it had had measles or other preceding disease. Three days later the nurse noticed sudden profuse hæmorrhage from the affected ear. She instantly put her finger into the ear, plugging it against further hæmorrhage until the house-surgeon came and introduced a permanent plug. Dr. Abbe saw the patient within an hour or so, and found it blanched from the loss of blood.

The next day he trephined in order to reach the seat of the trouble, which it was thought lay probably in the lateral sinus. He reached the middle fossa and found no abscess. The probe was passed under the dura in all directions, but there was no evidence of necrosis of the petrous portion inside the skull. He then introduced the probe into the auditory canal from whence the pus had been coming, and it came in contact with bare bone. On the slightest pressure dark blood welled up again. He could do no more than pack it and wait for a rise of temperature, thinking that if there should be invasion of the lateral sinus, with pyæmia, the temperature would rise. On the third day it rose suddenly to 104.5° F. He immediately went to the patient, but the temperature had then fallen again to 102.8° F. He decided next day to operate, tie the internal jugular, and open the lateral sinus and plug it, believing that the hæmorrhage came from the lateral sinus or jugular. He tied the jugular. It was not inflamed; it was not plugged; the lateral sinus showed no evidence of thrombosis. Blood was removed from it in a sterile syringe and careful cultures of it showed it to be sterile. Believing the child would die of hæmorrhage if something were not done, he inserted an iodoform plug in the lateral sinus, which he split across for this purpose, thus blockading the jugular between the ligature and plug to prevent further bleeding.

The child had lost so much by hæmorrhage and from the two operations that it lived only twenty-four hours after the last operation.

A careful post mortem showed no necrosis of the petrous portion of the temporal bone within the skull, but deep in the ear, at the bottom of the tympanic cavity, there was a little necrosis of bone. But inside the skull there was no evidence of involvement of the dura. A good clot had formed in the vein and lateral sinus which had been tied and plugged. A careful section of the bone showed a small, loose sequestrum of the inner plate of the tympanic cavity adjacent to the carotid. The carotid was plugged by solid thrombus, and at the point of contact with the necrosed bone,—it was eroded.

There was a large abscess of the brain in the occipito-sphenoidal lobe, containing nearly two ounces of pus. Evidently the result of arterial thrombosis, infection, and brain necrosis, for it had no other anatomical connection with the middle fossa.

CLAMPS FOR FEMORAL VESSELS.

DR. F. TILDEN BROWN presented a clamp for the femoral vessels for facilitating the operation of amputation at the hip-joint. He had devised the instrument for a special case. Where tubercular diseases in an adult called for either amputation or excision, which would be

Brown's forceps for compressing femoral vessels.

elected could only be determined after the joint and surrounding tissues had been exposed by an incision.

The extreme debility of the patient required a rapid operation. The Heuter-Parker-Barker incision and procedure was to be employed for exposing the joint. If amputation was then selected, through the upper part of the anterior incision the lower blade of the clamp would be directed by the finger under the sartorius muscle and under the femoral vessels just below Poupart's ligament, while the upper blade remaining outside the incision would rest above the vessels on the cutaneous surface. The similar curve, in each blade of the clamp,

makes, when the instrument is closed, an oval fenestrum encircling, but not compressing, the sartorius muscle. The angulation of the blades and handles of the clamp permit it to rest on the abdomen just parallel to the floor of the pelvic brim, where it exerts no drag upon the vessels and is wholly out of the operative field. The serrated spring-catch is made interchangeable for either handle, so that the instrument is equally convenient for both hips.

The incision which exposes the joint and through which one blade of the clamp is inserted serves at the same time for the commencement of the amputation wound by the anterior raquet method.

In this single case the efficacy of the clamp as a hæmostat, its ease of application, and general time-saving, exceeded expectation. The dressing was opened on the third day to note any cutaneous lesion or ecchymosis attributable to the clamp's pressure. There was not the slightest indication that any such compression had been exerted. The patient recovered from the operation and left hospital one month later.

EDITORIAL ARTICLES.

DOYEN ON EXTIRPATION OF THE GASSERIAN GANGLION.[1]

THE first attempts at intracranial resection of the trigeminal nerve consisted merely in the resection of the second and third branches of the nerve just before they enter the foramina in the base of the skull. Such were the first operations of Rose, of Horsley, of Krause, and of Hartley (1888–1892).

The methods pursued in these various operations, having for their purpose the resection of the branches of the trigeminal nerve within the cranial cavity, either with or without an attempt to remove the ganglion of Gasser, have been various. Some surgeons, like Rose and Navaro, have trephined the base of the skull outside and in front of the foramen ovale; others have made their attacks upon the nerve-roots upon a level with the temporal fossa (Horsley, Hartley, and Krause).

A third method was proposed by Doyen at the French Congress of Surgery, held April 5, 1895. This operator, disregarding the technique employed by the other authorities mentioned, recommended the resection of a portion of the temporal fossa, and of all that part of the greater wing of the sphenoid bone which is situated before and outside of the foramen ovale.

Doyen recognized the fact that the best guide to the ganglion of Gasser was the foramen ovale, and as a preparation for his operation made a series of careful observations upon a number of dried skulls, in order to determine the best route by which this opening could be reached. The foramen in question is situated at the base of the ex-

[1] E. Doyen, Rheims: Archives Provinciales de Chirurgie, Vol. IV, No. 7, July, 1895.

ternal wing of the pterygoid process, being about twenty millimetres from the antero-posterior ridge which separates this depression from the zygomatic fossa. This ridge, which is well shown in Figs. 1 and 2, is a certain guide. The rules for the operation as laid down by Doyen are as follows:

(1) A sickle-shaped incision is made through the soft parts over the temporal region, as shown in Fig. 3. The vertical portion, corresponding to the handle of the sickle, is from five to six centimetres long and is made in the space between the external auditory meatus and the outer angle of the orbit. This incision should pass not more

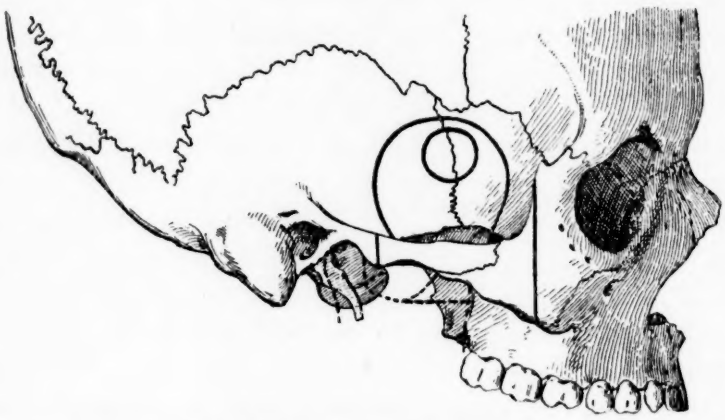

FIG. 1.—Showing trephine opening and extent of resection of the temporal and sphenoidal bones advised by Doyen.—Lateral view.

than fifteen millimetres below the zygomatic arch, and should avoid, as far as possible, the branches of the facial artery and nerve.

(2) Resection of the zygomatic arch close to the condyle, division of the coronoid process, and denudation of the temporal fossa.

(3) Identification of the inferior dental nerve, which divides two or three centimetres lower down; identification of the lingual nerve. Both are then divided and the cut ends held by toothed forceps. The internal maxillary artery is ligated close to the point of origin.

As soon as the isolation of the trunk of the inferior maxillary division as far as its point of exit from the foramen is assured, the

skull is opened by a trephine or other suitable means at the level of the spheno-temporal suture. By means of suitable cutting forceps the greater wing of the sphenoid and the squamous portion of the temporal bones are removed bit by bit, over the entire area of the lower portion of the temporal fossa exposed by the previous resection of the zygomatic arch.

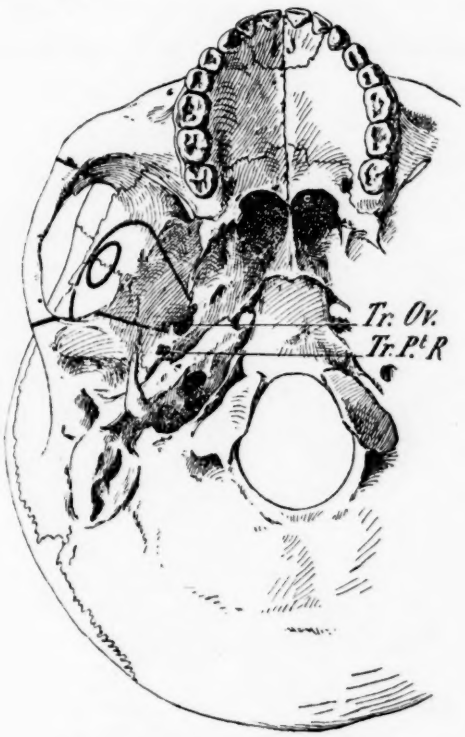

FIG. 2.—Same cranium viewed from below showing prolongation of the resection to the oval foramen.

As soon as the antero-posterior ridge, formed by the union of the vertical portion of the greater wing of the sphenoid with its base is reached, the basal part is attacked, and progressively removed as far as the foramen ovale. The external semicircumference of this is removed by the final cut of the forceps. The area of bone removed in the course of the operation is shown in Figs. 1 and 2.

The forceps are still attached to the inferior dental and lingual nerves, and with their aid the trunk of the inferior maxillary is raised and the intradural pocket in which the ganglion lies is opened from the outer side. Traction can then be made upon the ganglion itself, and with a little care its anterior and posterior aspects are exposed and freed from attachments. The superior maxillary division is made free in like manner as far as the foramen rotundum, where it is divided; finally, the ophthalmic division is cut at the sphenoidal fissure.

FIG. 3.—Primary incision in Doyen's method of extirpation of the Gasserian ganglion.

When, as was the case in the first patient upon whom Doyen operated, the superior maxillary division has previously been severed beneath the orbit, a little tension and manipulation will usually suffice to remove the remainder of the nerve.

The ophthalmic division is divided at its entrance into the sphenoidal fissure. By the aid of a small elevator the entire periphery of the ganglion is completely freed, and made movable by traction

upon its efferent nerves, which renders it possible to expose the superior border of the petrous portion of the temporal bone and the dural canal, which serves as a sheath for the primary trunk of the trigeminus, beneath the superior petrosal sinus. This last nerve-trunk is isolated in its turn, and then divided entad of the ganglion upon the posterior aspect of the petrous bone, beneath the venous sinus.

The carotid artery is seen at the bottom of the wound, protected by a thin, fibrous sheath. It is easy to avoid wounding the cavernous sinus, provided the operator be careful and skilful.

The first operation performed by Doyen was divided into two parts. The day was so dark at the time when the ganglion was first exposed that it seemed best to tampon the wound. Two days later the ganglion was quickly and easily removed. Convalescence was uneventful. The patient was strong and vigorous.

The last two patients operated upon died; the first one, suddenly, ten days after the operation, of cerebral apoplexy, when she seemed to be entirely cured; the other at the end of four days. In the latter case no cause for death, other than the extreme feebleness of the patient, could be found.

The operation devised by Doyen differs in several important respects from that of Hartley and Krause; the line of incision is not the same; the inferior dental and lingual nerves are exposed and divided before the cranial cavity is opened; the osteo-cutaneous flap is reflected backward and not from above downward. After the temporal fossa is cut through with the trephine, the upper wall of the zygomatic fossa is cut away with suitable cutting forceps as far as the foramen ovale.

In Krause's operation the lateral bony wall alone is removed; in that of Doyen the zygoma, the coronoid process, and both vertical and horizontal plates of bone are cut away.

Doyen isolates and secures control of the inferior maxillary nerve at its point of exit from the foramen, and also ligates the internal maxillary artery before the cranial cavity is invaded; Krause, on the

contrary, seeks the same nerve as his guide to the ganglion, but makes the necessary dissection to secure this end within the cavity of the skull.

The procedure of Krause does not necessitate so extensive a removal of bone, but the brain itself is far more likely to be injured by the retraction and compression of it which is necessary in order to gain access to the ganglion and main nerve-trunk.

Krause's operation is possibly to be preferred in fat patients; Doyen's in thin persons, in whom the zygomatic fossa is easy of access.

Although the main nerve-trunks, the ganglion, and the efferent branches are not so completely removed in Krause's as in Doyen's operation, the former surgeon has reported good therapeutic results, and five cases of success to one of failure. The future must decide which of the two is the best and safest.

The patient upon whom Doyen performed his first operation (March 6, 1893) is still living.

She complains of a slight lack of power in mastication; the temporal and masseter muscles were divided at their insertions, and the resulting cicatricial contraction has somewhat limited the movement at the temporo-maxillary articulation.

There is complete insensibility of the skin of both lips, of the cheek, of the temple, and of the forehead. Both eyelids, the superciliary region, and a part of the left side of the nose have much blunted sensation, taste and tactile sense are equally lacking on the left side of the tongue. The mucous membrane of the cheek, lips, gums, and palate is completely insensible.

Complete cure of the almost unbearable neuralgic symptoms has persisted for two and a half years; there is no complaint of functional troubles that have arisen from the removal of the Gasserian ganglion, and she is well satisfied to give up the general sensibility of most of the left side of the face, and of a part of the special senses in exchange for freedom from the pain which had made life almost unendurable. This is especially true, since hearing and sight remain intact.

H. P. DE FOREST.

RIBBERT ON THE ORIGIN OF TUMORS.[1]

THE question of the cause of tumors is still unsolved. None of the theories thus far advanced has received general recognition. Many are of the opinion that the genesis of the various sorts of tumors must not be regarded as the same. In considering this question, and grouping all tumors under one head, it is not necessary to recite the various generally known theories concerning their origin. As the theory of Cohnheim has a direct bearing upon the ideas which are to be advanced, it may be briefly referred to. Cohnheim regarded as the cause of the formation of tumors a failure or irregularity in the embryonal tissues. He showed that in the course of normal development, and indeed in a very early period, certain groups of cells—either because they were superfluous, or because they were detached and separated from their normal connections, or from some other reason—did not continue to grow and build up tissue and organs, but lay in a latent state, and later developed into tumors.

As a foundation for his theory he pointed to the tumors, such as teratomata and dermoids, which are to be traced for their origin to such separated cells. He also called attention to the not seldom inheritance of tumors and their congenital existence. He emphasized the fact that many varieties of tumor were found only in certain particular locations, as the dermoids, and that others, as the myoma of the prostate and the rhabdomyoma of the uro-genital tract, are found where especially complicated developmental processes take place; and that carcinoma shows an especial predilection for the *ostia*, which is easily explained by the theory of separated cells. He called attention to the multiplicity of many new growths, as the uterus-myoma, which develops so often because in the uterus there is such rich material present that under certain physiological conditions it takes on an active growth; and which probably without the physiological excitement would not take on an abnormal growth and develop into tumors.

[1] Deutsche medicinische Wochenschrift, 1895, Nos. 1, 2, 3, and 4.

These are the most important of the grounds upon which the theory of Cohnheim is based. It is not necessary to go further into the details, excepting to say that when there comes to these quiet cells, after a longer or shorter time, an increased blood-supply or a diminution of the resisting power of the surrounding tissue or some other condition, they begin to grow and form a tumor.

This theory has been much contested. It had and has as many champions as antagonists. Among the latter is Von Zenker, who declared before the *Naturforscher-Versammlung* in Berlin, in 1886, that the theory in general was not only improbable but impossible, and especially in regard to the carcinomata. Weigert declared that Cohnheim himself had subsequently retracted his opinions concerning the genesis of tumors.

An important obstacle has always remained in the way, and that is that these hypothetical separated cells cannot be discovered. This leaves but little actual data upon which to base a theory, and moreover the actual discovering of such must needs be very difficult. It has been the fortune of Roux[1] to discover separated colonies of cells in the middle, more rarely in the inner embryonal layer of frog embryos, sometimes in large numbers, once as many as thirteen, scattered among the other cells. He was able to tell the conditions under which these cells developed. Late impregnation is the most important. Roux's observations are, of course, not complete, for he could not say what would become of these cells, and whether a tumor would have developed from each one. They taught, however, the possibility of a separation of cells, as Cohnheim had assumed.

Of no less interest are the observations of Barfurth,[2] who observed in his experiments in the regeneration of the embryonal layers that by puncturing and turning in the ectoderm of the gastrulæ that a growth of cells very like a dermoid took place. Here also we do not know what such a group of cells would do in a fully-developed embryo.

[1] Virchow's Archiv, Band CXIV, und Verhandlungen der Naturforscher-Versammlung in Wien, Sitzung der Section für pathologische Anatomie, am 26. September, 1894.

[2] Anatomische Hefte, 1. Abtheil, Heft IX.

The observations of Roux and Barfurth, though very interesting and important, have thrown no light upon what might be the condition of such cells when the animal reached its complete development.

The older experiments with the experimental depositing of tissues have been without result. Tumors could not be made to grow from bits of all the different kinds of tissue which were implanted in the parenchyma of organs, in the blood-vessels, and in the anterior chamber of the eye. Nor were these experiments with any better results when, as Zahn and Leopold suggested, bits of embryonal tissue were used. Sometimes in the beginning there was a slight growth of the new tissue, but it always resulted in atrophy and absorption. The real cause of this was in all probability due to the fact that the new tissue was transferred to another animal body in which it encountered new and unusual vital conditions. When we consider that the actively developing bacteria are sensitive to transfer to a new animal body, that carcinoma which is of very active growth has only rarely been transplanted to an animal of the same species, and that deep transplanted tissue has always become absorbed, it is not difficult to conceive that these experiments with fœtal tissue should give so little result.

Though experimental investigations have given no considerable support to the theory of Cohnheim, still the best explanation that we have had of the origin of certain tumors has been from this hypothesis. This is especially true of the dermoid tumors and the rhabdomyoma. As a common example is the discovery by Grawitz,[1] of the tumors developing from separated bits of the suprarenal bodies. This discovery has a very important bearing upon the development of tumors from displaced embryonal cells, and will be spoken of later. For the present it suffices to observe that in connection with "separations" from the suprarenal bodies the development of malignant tumors is relatively frequent. But the presence of bits of suprarenal bodies underneath the capsule of the kidney is no rare condition, and, indeed, much more frequent than is the development of new growths

[1] Virchow's Archiv, Band XCIII.

from such separated bits of tissue. The same is true of the small masses of the same organ sometimes found in the broad ligament, in the epididymis, and in the liver. Most of these separations never go on to abnormal growths.

In many other cases, the separation of a small part of an organ which is otherwise normal does not result in the formation of a tumor. As examples may be cited the accessory thyroids, which might develop into tumors, but which usually remain unobserved; the accessory spleens, which show no more abnormality than the chief organ; and the accessory livers.

Why does no tumor develop in these cases? The reason is that the accessory part is constructed like the main organ from which it sprang, and that it can functionate quite as well as that. There is no special reason why these small bodies should give rise to tumors. When tumors do develop from them it is necessary to seek for some special explanation for such occurrences.

How is it then to be explained that tumors develop from fœtal "separations"? It must be borne in mind that the "separations" do not represent entire sections of the organ which contain all the elements of the organ in typical arrangement, but are composed of but a few single cells or cell-groups. This may be more fully elucidated.

The development of an organ follows through auto-differentiation existing as an inherited quality in the cells. Naturally this differentiation can only go on regularly when the cells, from the very beginning of their development, can develop one after another in a closed series. Each cell then places itself in typical arrangement in the organic whole. Assuming that one or more cells, without becoming deprived of any of their nourishment or injured in their growth, become partially or completely separated from their normal connections, the result is that their typical development is done with. Their further progress depends upon whether they still remain in more or less connection with the mother tissue or are entirely separated. The size and general character of the "separation development" will vary, depending upon whether the structure is the same as that of the orig-

inal organ, or whether there is a greater or lesser deviation from the parent structure, even to an entirely atypical growth. Depending upon these differences is the duration of the proliferation.

The normal organ grows until its completion,—*i.e.*, until it reaches its inherited size. At that time, all of its parts have been developed; and when this point has been reached, a further increase in its cells is prevented. By the size or tension of the organ, which is an inherited factor, is understood not alone the complementary mechanical pressure of the cells, but the sum of all of the complementary influences of the organ one upon another.

Such a point of tension is reached in the accessory bodies when they repeat the structure of the original organ. Then after a time the growth will stop.

The greater the deviation from the normal structure, the less will the further growth be checked by this cellular tension and just so much longer will the proliferation continue. If the development is a completely atypical one, a cessation of cell proliferation never really takes place. Thus arise the malignant tumors.

The cast-off cell-group need not take up any especial room; they can exist within the substance of the organ. Such conditions need not always lead to the formation of tumors. If the separated cells have a feeble vitality, or do not find sufficient nourishment in their new location, or are surrounded by too great resistance, they may perish. If the conditions of intrinsic growth and extrinsic resistance are exactly balanced, they may lie quietly for a longer or shorter time till one or the other of the conditions becomes changed. Such a condition would not often occur, but the separated cells usually go on developing and proliferating. The tumors which have their origin in such cells very rarely, therefore, begin from unchanged cells which have lain dormant for a long time, but must be regarded as continuations of a growth begun in fœtal life, and which has become accelerated as the conditions for growth became more favorable.

Ribbert assumes that the origin of tumors from "separated cells" does not depend on the embryonal character of the cells, but upon

their separation from their organic connections. So long as the cells continue to grow under the laws which govern the normal development of the organ their growth is a typical one; but when they become partially or completely separated from these conditions, they may form tissue which resembles more or less closely the structure of the organ, or it may be entirely different; as the embryonal character of the erring cells is not a matter of consequence, these cells can go on to the development of tumors immediately after birth. A consideration of the tumors which arise from abnormal processes in the development of the fœtus is next in order.

The least questioned of these are the remains of fœtal cavities and canals which have become abnormally enlarged. To this group belong the embryonal fistulæ and ducts of embryonal cysts, and the cavities which have their origin in the ductus thyroglossus.[1] To this class also belongs the cystic formation in the navel due to a partial patency of the ductus omphalomesentericus and designated as enterocystoma, and also the hydatids of Morgagni, and the cavities which originate in the remains of the ducts of Gartner.

Next come the external dermoid cysts which are due to inclusions of parts of the epidermis, and which Chiari taught remained connected with the superficial epithelium.[2] The fissural position of the dermoids—that is, their presence in places where fœtal fissures had existed or where clefts were closed, and because of which such inclusions might naturally occur—supports such a conclusion. The dermoids inside of the body, in the abdomen, lungs, etc., must be explained by a complete separation of the epithelial elements from which they take their rise. Cysts with ciliated epithelium, of which Hess[3] has recently reported such a cyst occurring on the hand, are explained on the ground of fœtal implantation.

Cholesteatoma of the cranial cavity cannot be classed with the dermoids. This tumor is regarded by many as a development and

[1] Haeckel, Archiv für klinische Chirurgie, Band XLVIII.

[2] Zietschrift für Heilkunde, Band XII.

[3] Zeigler's Beiträge, Band VIII.

metamorphosis of the endothelium of the pia, though most observers are now inclined to believe that it originates in epithelial cells which have some way become deposited in the cranial cavity. Ribbert[1] has examined a case in which there was nothing to indicate that the three-layered epithelial coat of the inner surface of the cholesteatoma had any connection with the endothelium of the pia. The very sharp line of demarcation between the epithelium and the normal pia mater made the idea of the origin of the tumor from "separated" epithelial cells seem very probable. This idea has a strong support in the case described by Bonorden,[2] in which the tumor contained glands and hair-follicles, structures belonging only to the external skin.

It must be assumed from the above observations that both the dermoids and cholesteatomata have their origin in groups of cells which have become turned in from the outer embryonic layer, which is indisputably the case with the former class of tumors. Ribbert goes further and assumes that not only epithelium, but also connective tissue can be thus dislocated, so that on the one side these cells can be well nourished and on the other side preserve an intact and permanent epithelial surface. In no other way can it be explained why the epidermis retains its typical form and does not simply build up a pile of disorderly epithelial cells. The same is true of the cholesteatoma of the ear, as it occurs as a primary growth in the cavities of the petrous bone. As is the case with the superficial dermoids, this tumor often remains in close connection with or very near the primary tissue. Later on it can happen that by virtue of the growth of the body and mobility of the organs the growth becomes separated from its origin. This same process of separation can also take place in the peritoneal epithelium. Ribbert has observed multiple cysts on the surface of the spleen lined with such epithelium.[3]

Next in order in the cystic epithelial structures come the tumors which arise from the glandular or adenomatous structures.

[1] Dissertation von Haegi, Ueber zwei Fälle von Cholesteatomen der Hirnhäute, Zürich, 1894.

[2] Ziegler's Beiträge, Band XI.

[3] Vide Dissertation, by Reuggli, Multiple Cysten der Milz, Zürich, 1894.

The thyroid is an organ which here comes into special consideration. The presence of accessory lobes to this organ is well known. Most of these, as above stated, show no tendency to abnormal growth. They do often become enlarged to a considerable size. The observations of Ziemssen are important, which show that these accessory nodules may occur within the trachea and be the origin of intratracheal adenomata.[1] Bruns states that such separations occur which he is entirely unable to explain upon histogenetic grounds.[2] Radestock[3] declared that he had been unable to find any connection between these intratracheal growths and the thyroid gland. Paultauf[4] came to the conclusion that the deposit was not an embryonal one, but that a direct growth of the thyroid through the tracheal wall took place on the ground of a probably fœtal connection of the thyroid with the trachea. He was able to discover the direct connection between the two. He also asserted that when deposits of tissue were of an embryonal character an active growth should be expected. The fact that most of the accessory thyroids show no great tendency to enlarge contradicts Paultauf's theory. A fœtal "separation" must have a certain cause, and this cause can be assigned not only to the "separation," but to the subsequent abnormal proliferation of the cells. Though there remain a connection between the superficial dermoids and the skin, the internal dermoids, though they have no epithelial connections, are of an analogous type.

It may be observed here that the "separation" of a bit of tissue must not be regarded as a passive process, but that, according to Cohnheim, an active and excessive growth of some tissue into another favors its becoming eventually included in the other and possibly entirely separated from its original attachments.

The thyroid may be used to illustrate in still another direction.

[1] Ziemssen, Handbuch der speciallen Pathologie und Therapie, Band IV.

[2] Bruns, Beiträge zur klinische Chirurgie, Band II; Heise, Ueber Schilddrüsentumoren im Innern der Trachea, Edenda.

[3] Ziegler's Beiträge, Band III, S. 291.

[4] Ziegler's Beiträge, Band XI, S. 71.

Wölfler[1] has endeavored to demonstrate the development of goitre from "fœtal adenomata,"—that is, from groups of thyroid cells which did not take part in the normal growth of the organ, but remained undeveloped. This idea has been contested by Hitzig,[2] who claimed that the anatomical findings do not corroborate Wölfler's idea, but that the growth seems to proceed out of the normal structure of the gland.

A second gland from which aberrant portions may go on to the formation of tumors is the mamma. Most commonly these are adenomata. E. Martin[3] has observed an interesting case. A lobule became separated from a supernumerary mamma, and converted into a fibro-adenoma. It still remained connected with the supernumerary gland by a very narrow string of tissue.

The adenomata which occur in the liver are evidently due to disturbances of the embryonal development. Ribbert has observed such a case, in which, in a fourteen-year-old boy, the organ presented very marked changes without any outward signs except a slight venous obstruction. The organ contained numerous nodules, varying in size from that of a pin-head to a pea, and corresponding in color with the rest of the liver. Microscopically, they differed in structure from the rest of the gland in that the strings of cells were much broader. Transverse section of these strings show that instead of one or two cells, they represented a thickness of four or five cells, so that, with the exception of a lumen, they resembled gland tubules.

In the cases of the above adenomata, certain parts of the glandular structure failed to develop into gland substance. Here, as in the dermoids, it must be borne in mind that not only the epithelium but the underlying connective tissue as well is concerned in the process. When this also develops into tumor tissue the result is fibro-adenoma or fibroma. Tumors of pure connective tissue may thus develop independently of the glandular tissue.

[1] Ueber den Entwickelung und Bau des Kropfes, Langenbeck's Archiv, Band XXIX.

[2] Archiv für klinische Chirurgie, Band XLVII, Heft 2.

[3] Langenbeck's Archiv, Band XLIV, Heft 4.

A tumor without the epidermis formation of the dermoid or the follicles of adenoma may result from these conditions. In such a tumor there would be a connective-tissue mass containing scattered epithelial cells having no glandular arrangement, but simply scattered about in disorderly groups. Whether such growths occur in the embryo we do not know. Cohnheim's original idea was that carcinoma had its origin in this manner. This sort of misdevelopment occurs in the jaw, and gives rise to abnormal formation of the teeth. It has been designated by Malassez [1] as *débris paradentaires*. It presents chains of epithelial cells which, in the formation of the parts, did not come into play but which still persisted. From these structures superfluous teeth,[2] cysts and adenomatous-like structures,[3] and sometimes, though rarely, carcinoma may develop.[4] Whether carcinoma really does arise from such structures or whether different conditions are superadded is still a question. The same may be said of the so-called branchiogenous carcinoma which occurs in the remains of the branchial clefts.[5] Here, too, it cannot be said whether the carcinoma has its origin from simple epithelial clumps or whether it springs secondarily from the epithelium of embryonic fistulæ or cysts.

So far tumors of epithelium have been considered. When we turn to the tumors of the connective-tissue type, we first come to two tumors described by Chiari [6] which are related to the dermoids, as he has seen fit to designate them as "fissurale," but which are formed not only out of epithelium, but also hair-follicles, glands, connective tissue, and fat. There are the tumors found on the raphé perenei of the new-born. Chiari accounted for them by assuming an excess of

[1] Archives de Physiologie normal et pathologique, 1885.

[2] Hildebrand, Deutsche Zeitschrift für Chirurgie, Band XXXV.

[3] Krause, Virchow's Archiv, Band CXXIV; Becker, Archiv für klinische Chirurgie, Band XLVII; Derujinsky, Wiener klinische Wochenschrift, 1890, No. 40; Chibret, Archives de Médecine expérimentale, 1892, No. 2; Massin, Virchow's Archiv, Band CXXXVI, S. 328.

[4] Ziegler, Lehrbuch, II Hälft, S. 486 (nach Bruns).

[5] Bruns, Mittheilungen aus der Chirurgischen Klinik zu Tübingen, 1884.

[6] Prager medicinische Wochenschrift, 1889, No. 49.

formative material, which was not used at the coalescence of the lateral gluteal masses.

Probably other congenital fibrous tumors in other locations are of analogous origin.

Tumors containing cartilage, which are frequently found in other parts of the body, are good examples of fœtal deposits. They are rarely composed entirely of cartilage, but are much more frequently made up of two or more kinds of tissue. Leaving out of consideration the cartilaginous tumors connected with the osseous system, the origin of these tumors has been sought for in "separated" cells and in a metaplasy of pre-existing tissue. As to the latter, it must not be lost sight of that a metaplasy of the tissues of the organ containing the tumor has never been observed; but that the metaplasy only occurs from the remaining portions of the new growth,—that is, from elements which are really "separated" cells, and which are then to be regarded as the primary embryonal stage in the development of the cartilage. Naturally all of these tumors are characterized by some peculiar features in the development of such cartilage from fœtal aberrant cells. They invariably grow in locations and in organs which, in their developmental stage, were near to tissue normally containing cartilage, or in which cartilage had grown from aberrant cells. Many of these tumors, on every side, present the evidences of such origin.

In the neck small cartilaginous subcutaneous tumors sometimes occur which are undoubtedly remains of the embryonal arches.[1] The chondroma of the parotid evidently originates from the "separated" cells of the embryonal arch or from the ear cartilage. Cartilaginous islands and tumors containing cartilage have also been observed in the thyroid, which are of the same character.[2] The carti-

[1] Buttersack, Virchow's Archiv, Band CVI, S. 206; Samter, Ibid., Band CXII, S. 77; Zahn, Ibid, Band CXV; Hoffmann, Greifswalder medicinische Verhandlungen, VI, February, 1892; Grimm, Prager medicinische Wochenschrift, 1892, No. 10.

[2] Zahn, Deutsche Zeitschrift für Chirurgie, 1885, Band XXII; Recklinghausen, Deutsche medicinische Wochenschrift, 1892, S. 339.

laginous tumors of the buccal cavity and the hairy polyps of the throat are, according to Arnold,[1] due to abnormal developments in the formation of the arches of the mouth. Ribbert[2] has seen in a new-born child a tumor of the lower lip composed of cartilage, connective tissue, fat, and teeth, which could only be accounted for by an aberration of cells in the formation of the lower jaw. He has also seen a tumor of the upper lip which contained cartilage and which could only be accounted for by an analogous process. The rare chondromata of the mamma gets its cartilage, according to Leser,[3] from the underlying ribs. Coën thinks that it is due to metaplasy. In the enchondromatous tumors of the genito-urinary organs, especially the testicle and kidney, the cartilage might come from the spinal column.

The so-called ecchondrosis physalifora of Virchow[4] belongs to the chondromata. Virchow explained this tumor by a growth and mucoid metamorphosis of remains of the spheno-occipital cartilage, after Heinrich Müller had stated that he thought it originated in remains of the chord. Pathological anatomists are divided on this question; some siding with Virchow, others with Müller.[5] Among the latter is B. Klebs.[6] Under the direction of Ribbert, Steiner[7] has made some original investigations in this line. He was able to confirm Müller's theory. The jelly tumors are the result of developmental abnormalities. Whether or no a cell "separation" plays any *rôle* is a question. It is very probable that it does, for these tumors are always situated directly underneath the dura of the clivus, while the remains of the chord are always found centrally in the cartilage or bone-furrow. Klebs recognized the possibility of misplacement

[1] Virchow's Archiv, Band III.

[2] Schoch, Dissertation über einen Congenitalen Zahnhaltigen Tumor der Unterlippe, Zürich, 1893.

[3] Ziegler's Beiträge, Band II, S. 381.

[4] Virchow, Die krankhaften Geschwülste.

[5] Zeitschrift für rationelle Medicin, 1858.

[6] Allgemeine Pathologie, 1889, Band II.

[7] Centralblatt für pathologische Anatomie, 1894, No. 11.

of the chorda, on the ground of having found this condition in an embryo with spina bifida. Hirschberg[1] has described two good-sized retropharyngeal tumors which, on account of their histological structure, he regarded as products of chorda remains.

Embryonal developmental disturbances come into consideration in the genesis of the osteomata which arise from chondromata. It is well recognized that many of the exostoses are due to abnormal intra-uterine processes; and there is a pretty well-grounded belief that the paraosteal bony tumors,—that is, those which do not arise from bone,—occurring in myositis ossificans progressiva, are to be accounted for by a deposit of periosteum-cells in the muscles and tendons. The rare osteoma cerebri is probably due to an embryonal misplacement of bone-producing cells. Multiple osteomata of the trachea may be placed with this same class. Here are found numerous small bony prominences of the mucous membrane, usually in close connection with the tracheal wall, and which are usually regarded as ossified enchondroses or as exostoses of the cartilage rings. Ribbert[2] has seen two cases in which these little osteomata were not all in bony or cartilaginous connection with the tracheal rings, but many of them appeared as separate bodies or connected with cartilaginous islands in the submucous connective tissue, scattered about and distributed along in irregular rows. He is of the opinion that in the embryo an abnormal outgrowth of the tissues which go to make up the tracheal rings takes place, whereby some of this tissue becomes deposited in the mucous membrane. From this tissue, cartilage develops which eventually becomes converted into bone.

Pronounced examples of fœtal aberration are found in many forms of lipomata. First of all are the fatty tumors which grow in the spinal canal in spina bifida, and which have been described by Von Recklinghausen.[3] Ribbert has observed the same thing;[4] and Arnold[5]

[1] Loc. cit., p. 310.

[2] Dissertation of Mischaikoff, Ueber Knochenbildung in der Trachealschleimhaut, Zürich, 1894.

[3] Virchow's Archiv, Band CV.

[4] Ibid., Band CXXXII.

[5] Ziegler s Beiträge, Band XVI.

has reported a similar case. Not only is fatty tissue found, but also connective tissue, muscle, and glandular tissue as well.

Deposits of foreign cells occur also in the skull at the site of fœtal clefts. Mixed lipomata are found in the cranium; and it is possible that the pure lipoma cerebri originates from aberrant cells. To this class belongs the congenital pharyngeal polypus, which is composed almost entirely of fatty tissue.

Rhabdomyoma belongs in this class. It occurs most commonly in the uro-genital tract. Ribbert[1] tried the experiment of making striped muscular tissue develop by metaplasy from the unstriped tissue, but has had to conclude that each of these varieties of muscular tumors must develop from independent cells, which it is very easy to conceive are the result of fœtal aberrations, and which in the uro-genital tract is not a difficult thing to believe. As to the kidneys, which are developed from two different genital layers, it is very easy to understand, as Hanan has shown, how foreign embryonal cells can become therein included. He endeavored to explain on this ground the cause of the rhabdomyoma found by Ribbert on the outside of the pelvis of the kidney. These tumors are much more seldom in other parts of the body. Wolfensberger[2] reported a rhabdomyoma of the œsophagus, and assumed that it originated from aberrant cells. Even the rhabdomyomata which occur in locations where nothing but striped muscle grows are probably also due to such fœtal aberrations. Corroborative of this view is the pronounced embryonal character of the new tissue of all tumors. The same is the case with rhabdomyoma of the heart as described by Kolisko.[3]

Whether or not leiomyoma has the same origin must still be further investigated. With the myoma uteri there is a possibility that the cause may be the same as that of the other tumors above discussed, but certainly in another sense from that of Cohnheim. The most recent observations of Hauser[4] would indicate that the remains

[1] Virchow's Archiv, Band CVI und CXXX.

[2] Ueber ein Rhabdomyom der Speisröhre, Ziegler's Beiträge, Band XV.

[3] Wiener medicinische Wochenschrift, 1893, No. 10.

[4] Münchener medicinische Wochenschrift, 1893, No. 10.

of the Wolffian ducts have something to do with causing the surrounding muscular tissue to develop into myomata. Babes, Diesterweg, Schroeder, and Ruge are of the same opinion; and Brens[1] and Von Recklinghausen[2] are very firm supporters of the theory. These observers have found inside of myomata epithelial cell collections in the form of cavities, canals, and cysts; a few containing ciliated epithelium. These structures need not necessarily have come from Wolffian bodies; they might, as Hauser has suggested, be derivatives from the uterine mucous membrane. Ribbert has a specimen in which a chain of epithelial cells extends seven or eight millimetres into the uterine wall, and which in the section appear as isolated epithelial islands. The extreme tip of this chain lies against a small myoma, but does not penetrate into its substance. Schottländer has seen the same thing, and claims that parts of the mucous membrane had grown into the tumor.[3] Hauser infers that the epithelial inclusion justifies assuming a similar abnormality of the musculature. That, of course, does not concern the Wolffian ducts. From this it may be concluded that the development of tumors can be so intimately associated with these epithelial collections that, as the uterus grows, these structures are dragged into the substance of the organ and their proliferation encouraged. In this abnormal process of dragging epithelial structures into the wall of the uterus, not only may this occur with the uterine glands, but simple islands of mucous membrane have been found deep within the uterine wall. Ribbert has discovered such an island lying along-side of a myoma, and in another case the epithelial cells penetrated the tumor.

Another tumor in which fœtal aberrations play a *rôle* is the glioma. Stroebe[4] has reported a case in which the tumor contained numerous acini lined with cylindrical epithelium. He was of the opinion that it originated in a folding out of the ventricle, and that the growth of the tumor had gone on with the extruded subepithelial

[1] Ueber epithelfürende Cystenbildung im Uterusmyomen, Wien, 1894.

[2] Deutsche medicinische Wochenschrift, 1893, S. 825.

[3] Zeitschrift für Geburtshülfe, XXIII.

[4] Naturforscher-Versammlung in Wien, 1894, Section für pathologische Anatomie.

glia layer. Ziegler[1] takes the ground that the neuroglioma ganglionare is probably due to developmental abnormalities. Wintersteiner[2] places glioma of the retina in the same class, assuming that it arises from fœtal "separations" of cells of the retina.

Associated with glioma are the tumors which, because of their situation on nerves, have been designated as neuroma, but which are really only connective-tissue tumors on the nerves; also the multiple neurofibroma of Von Recklinghausen,[3] which is, from a genetic point of view, very similar to the pharyngeal neuroma of Bruns.[4] They are often congenital and hereditary. It may be assumed that during the development of the nerve a disturbance occurs somewhere, which perhaps causes an abnormal arrangement of the cells or a deposit of connective tissue in the nerve. Ziegler states in general "that the development of that particular part of the nervous system was pathological, and that the subsequent growth of a fibroma was thereon engrafted."[5] Goldmann[6] is of the opinion that the nerve-sheath to a greater or lesser extent remains in a sort of embryonal condition, which later goes on to tumor-formation. It is not improbable that this embryonal character of the nerve-sheath depends upon an abnormal arrangement of the tissues. Perhaps still further-reaching aberrations come into consideration. Garrè found a neuroma containing epithelial cavities, which he believed originated in inclusions from the central canal of the spinal cord.

In the list of the congenital tumors due to developmental abnormalities must also be included the angiomata, especially the teleangiectasies, which are classed in the category of "fissure" new growths.

Lastly come the sarcomata. With these also there are forms which can be traced to embryonal defects. This is especially true of melanosarcoma arising from pigmental warts of the skin. For a long

[1] Lehrbuch, Band I, S. 310.

[2] Wiener medicinische Wochenschrift, 1894, No. 27.

[3] Die multiplen Fibrome, Berlin, 1882.

[4] Beiträge zur klinische Chirurgie, Band VIII, Heft I.

[5] Lehrbuch der pathologische Anatomie.

[6] Beiträge zur klinische Chirurgie, Band X.

time these have been attributed to embryonal developmental disturbances. Melanosarcoma of the eye also belongs to this class. Martin[1] has reported a case in which a pigmental sarcoma of the choroid was associated with a congenital melanosis of the sclerotic. He assumed that there was a pigment anomaly of the choroid, which was the origin of the growth.

Another such tumor is sarcoma of the vagina. Ahlfeld,[2] Kolisko,[3] Hauser,[4] and Pick[5] have all observed these tumors, especially in children, and have all agreed upon their congenital or fœtal character. This conclusion is strengthened by the fact that these tumors sometimes contain other tissue, such as striped muscle fibres and epithelial cells. This last fact brings up the sarcomatous mixed tumors, which are undoubtedly due to embryonal defects in development. As examples of these may be mentioned the chondrosarcoma of the parotid and testicle and the rhabdomyosarcoma of the uro-genital tract. Still further must be taken into account the combination of sarcoma and other varieties of tumor with the dermoid cysts. Such combinations were described by Virchow[6] as occurring in the anterior mediastinum, and in the ovary;[7] by Biermann[8] in the ovary; by Pinders[9] in the mediastinum; and by Jores[10] in the lung. Hausemann[11] has reported an adenomyosarcoma of the kidney, the structure of which resembled teratoma. Hildebrand[12] observed a cystic kidney with sarcomatous degeneration, the cause of which he assigned to an abnormal union of the cortical and the medullary substances.

[1] Virchow's Archiv, Band CXXXVIII, S. 111.

[2] Archiv für Gynäcologie, Band XVI.

[3] Wiener klinische Wochenschrift, 1889, S. 222.

[4] Virchow's Archiv, Band LXXXVIII.

[5] Archiv für Gynäcologie, Band XLVI.

[6] Virchow's Archiv, Band LIII.

[7] Ibid., Band LXXV.

[8] Prager medicinische Wochenschrift, 1885, No. 21.

[9] Ueber Dermoidcysten der vorderen Mediastinums, Dissertation, Bonn, 1887.

[10] Virchow's Archiv, CXXXIII, S. 66.

[11] Berliner klinische Wochenschrift, 1894, No. 31.

[12] Archiv für klinische Chirurgie, Band XXVIII.

It must be borne in mind that tumors which are due to embryonal abnormalities show a tendency to become sarcomatous. Garrè and Goldmann have spoken of this, and showed how that the multiple fibroneuromata tend to become sarcomatous. Chiari[1] saw a case of multiple exostosis, one of the bony tumors of which became sarcomatous. The new growth he found sprang from the marrow of the exostosis.

From the above observations, even if not all of them, are considered demonstrative, we can conclude that many tumors must be referred to embryonal disturbances of development. This hypothesis, as applied by Cohnheim to all tumors, cannot, according to Ribbert, be made to include all classes, such especially as the carcinomata.

Since the theory of Cohnheim cannot be accepted for all tumors, little, then, remains known as to the cause of tumors which have an extra-uterine origin. But inasmuch as this theory does hold good for certain growths of embryonal origin, it may be possible that conditions similar to these intra-uterine abnormalities may occur during the period of postfœtal growth, and thus produce tumors in the tissues of the adult just as the hypothesis of Cohnheim assumes that tumor-producing changes occur in the tissues of the embryo. Or are the extra-uterine tumors of an entirely different nature?

It is hard to believe that at the time of birth the genesis of tumors suddenly changes. This can only be reconciled by the view that during the folding-in of the embryonal layers "separations" of cells occur. But this does not imply that after birth a similar shutting-out of cells from their normal connections cannot take place. Ribbert claims that this does occur, and bases his theory thereon. He makes the following declaration:

In the adult, as well as in the embryo, cells and cell-groups become separated from their normal connections and without having their nourishment shut off, remain in a latent state, and then begin again to grow and develop into tumors.

It must first be decided whether the cells of the adult have suffi-

[1] Prager medicinische Wochenschrift, 1892, No. 35.

cient power to originate a tumor. As has been stated above, the growth of an organ ends when it reaches its inherited size and when a certain degree of tension is attained. There are two conditions under which a further proliferation may occur,—compensatory hypertrophy and regeneration. The first is caused by direct functional irritation of the secreting part of an organ, as in the kidney; or through the influence of the nervous system, as in the muscles and probably also the testicles. Regeneration replaces by new development tissues which have been destroyed. Sometimes, as in the skin, it is a continuous and permanent process; in other cases it takes place only under certain conditions. The cause of regeneration of destroyed tissues is an increase of the tissue tension. The only thing which can be observed is the manifestation of this slumbering cellular potentiality in the building-up of the destroyed tissue. If the cells could not proliferate, the tissue tension could not be accommodated. Thus the power of regeneration depends upon the capacity for proliferation of the cells. This varies greatly in the different organs. It is absent, for example, in cartilage; very slight in the liver; and very active in the salivary glands and skin. After H. E. Ziegler and Von Rath had demonstrated the fact that regeneration begins in the least differentiated cells of an organ, Ribbert found the same to be especially true of the salivary glands and the kidneys, in which regeneration takes place in the efferent ducts while the functional elements do not take any part.

Liver-cells, for example, which normally do not have to proliferate rapidly are capable of regenerating when the necessity arises. About a wound of the liver many cells are found to contain mitoses.

In the fully-developed adult body, cells which in the normal organ show no tendency to increase, are capable of proliferation. In many tissues, as the skin, this proliferation goes on as a normal function. The question naturally arises as to whether such cellular proliferations occur independent of regeneration and compensatory hypertrophy, and whether this proliferative tendency of cells in the adult body may not be the cause of tumors.

Ribbert is of the opinion that this is the case. If the diminution of the tissue tension is the exciting cause on the one hand; in the same sense, the separation of cells from this normal tissue connections is an exciting cause on the other. The restraining influence of the surrounding tissues ceases, and the latent power of the cells becomes manifest. In tissues where there is normally a constant proliferation of cells, as in the skin, the cell-proliferation does not tend to diminish the tissue tension, but rather increases it. As is the case in regeneration, different degrees of proliferative activity are manifested by different kinds of cells.

As in embryonal tissue, so it is here that the character of the new growth depends upon the character of the separated cells, and how much the new growth deviates from the structure of the parent tissue. The more pronounced the atypical character is, the less is the possibility of restoration of the normal growth-checking tension between the tissues, and just so much more lasting will the proliferation be.

A tumor need not develop in every case of cell-separation, but, as is the case in the embryo, the aberrant cells may perish, or by virtue of the surrounding resistance they may lie dormant for an indefinite period. But when the resistance of the tissues becomes reduced, a tumor develops. All of this goes to show that in adults the separation of living cells from their normal connection is the cause of the development of tumors.

As yet, it may be said, there is insufficient ground for assuming that such is the cause of tumors. More accurate histological study of this question will bring us still nearer to the truth. The commonest example of tumor originating in this way is the multiple chondromata and exostoses. Virchow[1] was the first to show that bits of cartilage which became separated from their connections with the rest of the cartilage by abnormal ossification of the epiphysis-lines in rachitis were the origin of enchondromata. This declaration met with general approval. Since then the same observer has made other similar

[1] Die Krankhaften Geschwülste, 1, S. 478.

investigations, the last of which was published before the Naturforscher-Versammlung in Halle, at which time Ackermann and Hanan made similar reports. Ackermann found separated islands of cartilage in the case of a large enchondroma of the knee-joint region. Hanan found the same thing in a case of multiple chondromata of the skeleton. Later observations have been reported by Zeroni,[1] Colley,[2] and Nasse.[3] Some of these observations confirm the idea that not only chondroma but osteoma as well originates from such islands of cartilage. Of course, solitary as well as multiple tumors can develop in this way.

Of the connective-tissue tumors, sarcoma is the most important. Sarcoma often originates in other connective-tissue tumors. It often occurs at the seat of fractures, implying a "separation" of periosteal or marrow-cells. In the same line must be considerated the recently-studied development of sarcoma from decidua and placenta. These tumors have been designated as sarcoma deciduo-cellulare, deciduoma malignum, and sarcoma of the chorionic tufts. Gottschalk[4] has written upon this variety of sarcoma; so also have Klien[5] and Marchand.[6] The non-malignant tumors described by Zahn[7] and Kahlden[8] also belong here. In all of these cases the tumor originated in remains of the fœtal membranes or placenta from separated cell-groups.

Turning now to the epithelial tumors, the question arises as to whether growths similar to dermoid cysts and cholesteatomata can originate after birth. The answer is in the affirmative. We know that experimentally tumors similar to the dermoid growths can be developed. The experiments of Schweninger[9] and Kaufmann[10] show

[1] Arbeiten aus dem pathologischen Institut zu Göttingen, 1893.

[2] Deutsche Zeitschrift für Chirurgie, Band XXXVI.

[3] Berliner medicinische Gesellschrift, 25. Juli, 1894.

[4] Archiv für Gynäcologie, Band XLVI.

[5] Ibid., Band XLVII.

[6] Aerztlicher Verein in Marburg, 4. Juli, 1894.

[7] Virchow's Archiv, Band XCVI.

[8] Centralblatt für pathologische Anatomie, Band II, Nos. 1 and 2.

[9] Centralblatt für die medicinische Wissenschaften, 1881.

[10] Virchow's Archiv, Band XCVII.

that when bits of skin are buried in the tissues and covered by sewing the skin over them, cavities like dermoid cysts develop. Ribbert has modified the experiment by cutting out a skin flap which he introduced into the abdominal cavity, leaving it nourished by a pedicle, which was not severed. The connective-tissue surface of the flap grew fast to the peritoneum, thus enclosing the epithelial surface in a cavity. This cavity was found lined with epithelium, from which hair was growing, and filled with hair and exfoliated epithelial *débris*. The traumatic epithelial cysts which are observed most commonly on the fingers are analogous to the above. Here the callous skin forms the so-called "iris cysts."

According to many authors cholesteatomata occur in adults as a result of a similar process of displacement of cells. This is very probable in the tumors of the ear which are due to an ingrowth of epithelium from the defective tympanic membrane into the ear cavity and the neighboring bone-cells. Ribbert has been able to demonstrate the direct connection of the external epithelium with the lining of a cholesteatoma cavity. In such growths there is not only a growth of the epithelium, but also an active proliferation of the subepithelial connective tissue. This tissue is rich in cells and blood-vessels, and in it originate the giant cells which attack the bone. There is not only a change in the pre-existing tissue, but also, at least as far as the accessory cavities of the petrous and mastoid portions are concerned, an ingrowth of new connective tissue. On the other hand, Baginsky[1] explains the origin of cholesteatoma on the same ground as the above-mentioned tumors of the cranial cavity.

But little is known of the postembryonal displacement of gland structure which might give rise to adenoma. It is possible that adenoma of the liver belongs to this category. It occurs very commonly with cirrhosis of the liver, and is often, in such cases, regarded simply as compensatory hypertrophy. This may be right, so far as it corresponds in structure with the normal organ, leaving out of account the size and number of the cells. In other cases there is not

[1] Berliner klinische Wochenschrift, 1894, Nos. 26 and 27.

a great deviation from the normal appearance. May it not be concluded that portions of the hepatic tissue are separated from their normal relations and connections by the new growth of connective tissue, and grow independently and produce adenomata? The difference in structure would corroborate this view; and it is easy to understand that such isolated portions are not more capable of reproducing the normal structure of the liver.

In the same way can the true adenoma of the kidney be accounted for. In the ordinary contracted kidney are often found multiple small tumors, which differ more or less in their structure from the normal kidney. They are made up usually of irregular alveoli separated by septa and covered on their inner surface with projections. These structures can be abnormally formed uriniferous tubules, formed out of connection with the normal kidney structure. Ribbert has observed two tumors the size of a pin-head in the same kidney. In a connective-tissue wedge lying on the surface was found a small adenoma made up of a number of alveoli and separated entirely from the surrounding cortical substance.

Lastly, carcinoma may be considered. Here, too, are two questions to be decided: Can carcinoma arise from the "separation" of epithelial cells? and can we be sure upon the ground of anatomical observation that in the formation of carcinoma epithelial deposits really play a *rôle?* According to Ribbert's observations both of these questions can be answered in the affirmative. For the answering of the first question are two groups of facts. The first includes the observations of carcinomata which have developed after the removal of benign epithelial groups. The cases which have thus far been reported have all been ovarian cysts. Pfannenstiel[1] has worked up this subject, and says that many of the cases in the literature are imperfect, especially with regard to the histological examinations of the primary tumor, which were not thorough enough. The carcinoma developed either in the abdominal cavity or in the scar of the laparotomy wound. Pfannenstiel has reported one of the latter class. Several years after

[1] Zeitschrift für Geburtshülfe und Gynäcologie, Band XXVIII, Heft 2.

the removal of a small simple cystic ovarian tumor a typical adenocarcinoma developed in the abdominal scar. Pfannenstiel came to the same conclusion as Olshausen, that the development of the carcinoma was referable to the cystic tumor; that epithelial cells from the benign cystoma became detached and implanted either in the abdominal cavity or in the wound, and eventually developed into a carcinoma. He is of the opinion that the last process did not follow immediately upon the epithelial deposit, but that first an adenoma developed, and from that a carcinoma sprang. Ribbert is of the opinion that this is not the case, but that the epithelial cells undergo the same changes as when collections of such cells are placed in the peritoneum or in a wound. They tend to form a cyst as the epidermis cells do. They spread out over a surface and separate themselves from the connective tissue. A few cells become detached and easily enter the lymph-channels and form a carcinoma. In certain cases it cannot be denied that, as Pfannenstiel has assumed, an adenoma may precede the carcinoma.

In 1892, Professor Kröulein extirpated a tumor of the abdomen, which was found to be a monolocular cyst of the urachus, though at the operation its origin was not suspected, and which has been described in a dissertation by Dösseker.[1] Soon after the operation a very rapidly-growing carcinoma developed in the abdominal scar, and quickly caused the death of the patient. The large tumor-mass presented the typical picture of a carcinoma made up of soft protoplasmic cells. Ribbert observed that these cells enclosed an unusually large number of vacuoles, as he has observed only in the bladder, and previously described as peculiar to carcinoma of that organ.[2] It was upon this peculiar feature that he was able to declare that the cyst was a cyst of the urachus, and that some of its epithelium had become lodged in the abdominal wound at the operation. The tumor was not preceded by any cyst formation.

The second group of facts which come into consideration here

[1] Klinische Beiträge zur Lehre von den Urachus cysten, Zürich, 1892.

[2] Deutsche medicinische Wochenschrift, 1891, S. 1179.

contain the observations of metastases from benign adenomata. Struma of the thyroid belongs here. The observations of Cohnheim of metastases from a simple goitre are well known.[1] Von Recklinghausen[2] suggested that it might have been a "jelly" carcinoma. Since then a number of such cases has been reported, and the question has arisen as to whether goitre might not in some cases be really carcinomatous. The metastases alone bespeak the carcinomatous character of the tumor, while the observations of Marchand,[3] Middledorpf,[4] Von Eiselsberg,[5] and Ewald[6] have shown that the metastases have the simple structure of the ordinary soft goitre. This circumstance may seem to be contradictory to the theory of Ribbert. When no carcinoma develops, it may be said, this shows no tendency on the part of the aberrant cells to undergo carcinomatous degeneration. But it must not be lost sight of that there is an actual metastasis formation and uncircumscribed development of the epithelial cells originating in a benign struma. Whether or no the result is the formation of a typical histological picture of carcinoma is not of especial consequence as far as Ribbert's theory is concerned. It is important that the epithelium which becomes separated from its organic connections shows an exaggerated growth capacity. Here, as in the case of the above-mentioned ovarian cysts, the manner in which the aberrant epithelial cells grow is entirely dependent upon the circumstances which surround them in their new location.

The same is the case with adenomata of the liver. They show a tendency to metastasis, which tendency increases as the deviation from the normal structure of the liver is greater. Still, a tumor which nearly repeats the structure of the organ can give rise to these changes, as the case reported by Frohmann shows.[7] This formation of meta-

[1] Virchow's Archiv, Band LXVIII.

[2] Ibid., Band LXX.

[3] Aerztlicher Verein zu Marburg, 7. März, 1894.

[4] Archiv für klinische Chirurgie, Band XLVIII.

[5] Archiv für klinische Chirurgie, Band XLVI and XLVIII.

[6] Berliner klinische Wochenschrift, 1892, No. 37.

[7] Neuwerk's pathologisch-anatomische Mittheilungen, XVI.

stases is not to be wondered at when we think that these adenomata have been spoken of above as tumors, which develop disconnected from the general structure of the liver tissue, and in such an active manner that the vessels and lymphatics are easily encroached upon, —a condition which is easily possible in the liver.

In this connection may be mentioned a cyst adenoma of the testicle described by Adler. It was a simple cyst-adenoma without any suspicion of sarcomatous or carcinomatous degeneration. A year and a quarter later the patient died of cystic metastasis in the lungs. Similar to this are the cases of benign enchondroma which, by entering the veins, cause metastasis.

The two groups of metastasis-formation which have been briefly illustrated teach with much conclusiveness that epithelium from tumors which present the anatomical structure of benign growths, when it becomes dislodged from its organic connections can develop independently and give rise to tumors which correspond with the primary growth or to carcinomata.

This being conceded, it is not much of a step to declare that epithelium from normal tissue also, when in a similar manner it becomes separated, can develop in a similar manner and form carcinoma. It must be assumed that in such a case there is no checking of nutrition, or only for a short time, and that the conditions for development in the new location are favorable.

Certain objections to such a theory must naturally occur. It might be suggested that a separation of normal epithelial cells is hardly possible. In the analogous cases of the ovarian cysts and adenomata there was either an operative separation or the cells were in such an active state of development that the vessels were easily encroached upon and entered. In this light it is hardly to be regarded as accidental that adenoma forms metastases, which in the thyroid we refer to the lymphatic vessels and in the liver to the blood-vessels. All of these objections naturally are refuted when Ribbert has observed the splitting up of epithelial cells under such conditions, as will be shown. These observations were made, as we shall see, only in local metastases.

It is well known that cell-metastases occur without the formation of a tumor. This occurs in the separation of liver cells, bone-morrow cells, and placental giant cells. But whether these last two varieties of cells possess a more active developmental energy or not is a question. As to the liver-cells, it is certain that in the normal liver they very rarely present mitoses. It is evident, therefore, that the entrance of cells into the blood-current always occurs under abnormal conditions, and the latent developmental energy in such cells is usually not great enough to result in the formation of a tumor. Furthermore, these cell-separations occur under conditions of disease which usually result in the death of the patient, and which, therefore, do not favor an abnormal growth of cells.

If the power of proliferation in the metastatic cells is of influence upon the later development, we should expect, as is the case with carcinoma, a growth of the same; especially when of epithelial character, which would continue indefinitely to proliferate, as also occurs in benign epithelial tumors. It may be noted here that carcinoma in general originates almost always from epithelium in which mitoses are either always present or are present under certain conditions (as the mammæ). Such cells are those of the ducts of glands, the superficial epithelium of the skin and mucous membranes, the glands of the intestine and the testicle. Structures in which the epithelium does not normally present mitoses, as the kidney, liver, and salivary glands, are rarely the seats of origin of carcinoma.

Of the influences capable of causing epithelial metastases, trauma should be first mentioned. It is also very probable that traumatic influences have much to do with causing the cell-separations which give rise to many of the other tumors. In carcinoma, the changes in the subepithelial connective tissue play an important *rôle*.

Ribbert has already written upon the etiology of carcinoma.[1] The theory that carcinoma is due to an increased growth-energy of the epithelium, or to a diminution of the resisting capacity of the

[1] Virchow's Archiv, Band CXXXV; Münchener medicinische Wochenschrif, 1894, No. 17; Centralblatt für pathologische Anatomie, 1894, S. 697.

connective tissue, or both conditions combined, he regards as untenable. A correct conclusion can be reached only by studying the earliest stages of growth. In such observations he has found that the first changes are not a penetration of the epithelial cells into the connective tissue, but that the first thing observed is an active increase of the cellular elements of the subepithelial connective tissue. This causes a lifting up of the epithelial layer, which becomes irregular and convoluted. This seems to have little to do with the process that follows. The increased connective tissue grows up among the epithelial cells and causes irregular separations of the cells from their normal relations so that they become divided into groups and islands surrounded by the new connective tissue. This process does not interfere with the nourishment of the cells, but leaves them in condition to continue to proliferate. As they are now disconnected from the superficial cells, they cannot proliferate upward, and so must grow where the connective-tissue cells will allow. They proceed in the direction of the least resistance,—namely, into the intercellular spaces and lymph-canals, and in this manner the carcinoma develops. It is probably that, by virtue of the inflammatory state of the connective tissue with its accompanying hyperæmia, the epithelium has an increased growth capacity.

Ribbert has again had an opportunity recently to examine a carcinoma in its earliest stages. It developed from a psoriasis linguæ and presented small alveolæ in the subepithelial connective tissue. In this case, also, the growth of connective tissue among the epithelial cells was present; but it seemed to illustrate another *modus* of epithelial cell separation. The lower ends of the epithelial strings were separated from the rest of the cells either by the upward tension of the tissues or by virtue of the connective-tissue cells growing in between.

These observations hold good only for carcinoma springing from the flat epithelial cells. Ribbert has studied a carcinoma of the stomach, and found analogous conditions. The mucous membrane was thickened by an increase in the connective tissue and lengthening of

the gland follicles. In many places within the thickened area the glands were split up by the infiltration of connective tissue into small groups or single cells. The connective-tissue growth had broken through in many places into the muscularis mucosæ, and contained here and there collections of epithelial cells. This tissue did not anywhere extend deeply beneath the muscularis mucosæ, or even into the deeper layers of the mucosa. Nowhere did it penetrate the true muscular layer of the stomach. The impression given by this picture was that the gland epithelium had been separated by the growth of connective tissue, and that these by further proliferation pressed on down into the deeper connective tissue.

From these observations it would seem possible that epithelial separations may occur in the adult, and that normal epithelium, possibly only under the influence of long-continued inflammation, may thus originate carcinoma. It is not difficult to apply these ideas to all of the different varieties of carcinoma. It is a question whether the branchial carcinomata originate directly from a growth of epithelial remains in the fœtal clefts or develop secondarily from epithelium which has become separated by connective-tissue growth from its connections in a congenital fistula or cyst. The same thoughts apply to the origin of carcinoma from fœtal cysts. The same holds true of the origin of carcinoma from dermoid cysts, adenomata, and the paradental epithelial deposits of Malassez.

Bits of suprarenal capsule have been found embedded in the kidney, and these have sometimes been the origin of kidney tumors. It is not necessary that every bit of such separated tissue shall develop into a malignant tumor; often they remain unchanged or simply form adenomata. Tumors arise, then, by virtue of the separation of cells or groups of cells from their anatomical connections and their then assuming an independent growth. Dr. Ricker has made some valuable histological observations in the study of separations from the suprarenal bodies. He found a case in which a small mass of suprarenal capsule tissue was separated from the kidney tissue, but partially by a connective-tissue capsule. In one place this capsule was not

present, and here lay a number of small collections of suprarenal capsule cells in the kidney tissue between the uriniferous tubules. The connective-tissue substance of the kidney was but slightly increased, though in some places there was a considerable increase. Ribbert believes that from such separated cells a malignant tumor would develop.

As to the causes of the proliferation of the connective tissue which goes on to the formation of epithelial metastases, they must be very various. In some of the cases, as Ribbert has shown,[1] a subepithelial tuberculosis, especially that form designated as lupus, can be regarded as the cause. In such tissue carcinoma develops not infrequently. Of course the necessary inflammation can be caused by other micro-organisms, and possibly by the protozoa; though the identification of the latter has not yet been accomplished.[2]

It is not necessary that the inflammation be of parasitic origin. It can be caused in many other ways, as has long been known. As examples are the "parafin-," "tar-," and "chimney-sweep's cancer," the occurrence of carcinoma in scars, sequestrum cavities, on suppurating surfaces, in the gall-bladder in cases of gall-stones, in the digestive tract of alcoholics, in ulcers of the stomach, in seborrhœa of the skin, and psoriasis of the mucous membrane of the mouth. Many more such examples might be cited.

From the above observations the following may be deduced as to the abundant proofs of the origin of tumors.

Tumors originate before and after birth from a partial or complete separation of cells or groups of cells from their organic connections. The separated cells, no longer subject to the restraining influence of their normal connections, and still receiving an adequate nourishment, grow, and form tumors which, according to the size and organization of the separated mass, correspond in general structure with the organ from which they sprung, sometimes more, sometimes less. There is no essential difference between tumors of intra-uterine

[1] Münchener medicinische Wochenschrift, 1894, No. 17.

[2] Deutsche medicinische Wochenschrift, 1894, No. 15.

origin and those which develop after birth. Carcinoma originates from epithelial cells, which become separated in the epidermis, in the mucous membrane, or in glands, by the ingrowths of connective tissue, and thus become deposited in the same.

Ribbert's observations are important because of their bearing upon the origin of tumors in adults, and explain what the theory of Cohnheim has always failed to make clear. Ribbert's theory of the origin of carcinoma does not necessitate the existence and lying-dormant of carcinomatous cells for forty years, but explains how that diseased or normal epithelial cells may become tilted out of place by trauma, inflammation, or other causes, and continue to grow surrounded by connective tissue and in easy access to the lymphatic channels. It may be regarded as a continuation and elaboration of the principles of Cohnheim.

JAMES P. WARBASSE.

INDEX TO SURGICAL PROGRESS.

GENERAL SURGERY.

I. Actinomycosis caused by the Entrance of Foreign Bodies. By Dr. E. Hummel (Tübingen). Notwithstanding the frequency of actinomycosis in men, but twelve cases are reported in which the mode of infection is known with certainty. In these it was found to be due to the presence of a foreign body, usually a piece of a barleycorn or some other kind of grain. The disease occurs most frequently among workers in grain, who are in the habit of chewing it.

The author reports a case of actinomycosis of the upper jaw, caused by a piece of oat-chaff, which had evidently entered through the mucous membrane of the mouth.

The author believes that actinomycosis is not communicated directly from animals to man, nor by eating the flesh or milk of diseased animals, but that animals and men are infected from a common source. The most frequent carriers of the disease are pieces of grain which are forced through the mucous membrane or enter about carious teeth. Foreign bodies of this kind have been found very frequently in animals suffering from the disease; but if not found, it does not invalidate the theory, since pieces of grain and vegetable matter are soon absorbed and disappear entirely.—*Beiträge zur klinische Chirurgie*, Band xiii, Heft 2, 1895.

G. R. White (New York).

II. Steam as an Hæmostatic. By Dr. Snegirew (Moscow). For the past eight years Snegirew has been in the habit of using steam as an hæmostatic agent in surgical operations which involved the cavity of the uterus. He uses it in the following manner:

After the uterus has been dilated, a fenestrated catheter is introduced into the cavity. In the lumen of the instrument passes a smaller tube which is connected with a steam-boiler. The steam has a temperature of about 100° C. (212° F.). After the steam has been allowed to enter the cavity for from one-half to one minute its caustic and hæmostatic action begins, and the mucous membrane of the uterus is soon covered with a thin layer of albumen. The action is painless, and any existing fetor or sensitiveness disappears.

After a long series of experiments upon animals in which Snegirew removed portions of the spleen, liver, and kidneys, and had assured himself that the action was a constant and reliable means of securing hæmostasis, he tried the method in a number of operations upon human beings. The treatment was used with satisfactory results in amputation of the cervix uteri, in removal of fibromyomata to check the bleeding of the uterine stump, and in abscess to destroy the offensive odor and favor healing.

It is worthy of note that the process of healing progresses without delay. In parenchymatous organs the surface appears smooth and shining.—*Deutsche medicinische Wochenschrift*, 1894, No. 38.

III. Steam as an Hæmostatic and Aseptic Agent. By Dr. J. Jaworski (Warsaw). Jaworski has still further developed the procedure of using steam in operations upon the uterus and other organs as advocated by Snegirew (*vide supra*). His mode of procedure was as follows: After dilatation of the cervix and curettement of the cavity of the uterus, or even without this preliminary step, he passed into the cavity a catheter whose end was pierced with numerous sieve-like openings; within this was a smaller metallic tube connected with a steam generator. The temperature was about 100° C. (212° F.). The patient experienced no pain. Jaworski satisfied himself of the cauterizing, anæsthetic, deodorizing, hæmostatic, disinfecting, and aseptic action of steam used in this manner. Its best action was found to be in checking hæmorrhage in parenchymatous organs. Jaworski was able to remove portions of the liver, kidney,

lung, and a lobe of the uterus in his experiments upon animals, without loss of blood. His operations upon man in which this method was used, embraced resection of the knee, amputation of the breast for carcinoma, lipomata, angiomata of the skin, amputation of the cervix uteri, checking of hæmorrhage in the uterine stump after the removal of a myoma, and others of equal severity.

He has also made use of steam in minor operations upon the uterus. A Siegel inhaler first served as a generator for the required steam, but in his later experiments an apparatus for distilling water was used. The steam was conducted into the uterine cavity through a Bozemann-Fritsch catheter with sieve-like perforations. The steam was applied for from one-half to one minute. Jaworski tried steam in three patients who had been subjected to uterine curettement, in one of them the vaginal portion of the cervix had also been amputated. The aseptic, deodorizing, and hæmostatic action of the steam was fully demonstrated; the anæsthetic action upon the uterine mucous membrane was not so certain.

Jaworski concludes, as a result of his present experience, that in cases of hæmorrhage, of stinking discharge, and of carcinoma of the uterus the steam is of great value, and predicts that in the future it will be used extensively not only in gynæcological operations, but also in the domain of general surgery.—*Wiener medicinische Presse*, 1895, No. 3.

H. P. DE FOREST (Brooklyn)

IV. Experiments on the Pancreas for Causing Fat-Necrosis. By DR. HILDEBRAND (Göttingen). It is a well-known fact that we find at autopsies and operations that certain inflammations of the pancreas which cause hæmorrhages and necrosis of that organ are the cause of a more or less pronounced fatty necrosis in the omentum and mesentery, especially in the region of the pancreas and even in the organ itself. The causative relation of these two facts—disease of the pancreas on the one hand and fat-necrosis on the other—has not heretofore been explained; and experiments in this line

have been wanting. Langerhans caused fat-necrosis in twelve experiments by injecting a mixture of water, finely-powdered glass, and pancreas. Hildebrand has assumed that the juice of the pancreas is the cause of the necrosis, and has made a number of experiments to produce fat-necrosis, by obstructing the secretion of the pancreas. He used cats in his experiments. The result of his experiments was to demonstrate in all cases that a simple obstruction to the vessels and secretion of the pancreas, or an escape of pancreatic fluid into the abdomen, causes a typical fat-necrosis in the pancreas itself, in the omentum, and in the mesentery, probably due to the contact of the fat with the secretion which flows from the wound in the pancreas, or which becomes diffused upon the surface from obstruction in the organ. Which of the various ferments of the pancreas causes the change is not stated. The trypsin would be first thought of, for, according to Kühne, it has "a very destructive action upon the subcutaneous tissue." The fat ferment which splits up neutral fat into glycerin and fatty acids might be the cause. This would give the calcium in the blood an opportunity to unite with the acids and form the calcium salt discovered by Langerhans.

In the case of man, when we suppose an infective inflammation of the intestine, with catarrh of the pancreatic duct and obstruction to the discharge of pancreatic juice, a condition of engorgement of the gland with its own secretion takes place, and the corrosive action of the trypsin can bring about the peculiar changes and hæmorrhages observed in such cases.—*Centralblatt für Chirurgie*, 1895, No. 12.

V. Catgut as a Source of Pus-Infection. By DR. C. LAUENSTEIN (Hamburg). During the past year Lauenstein observed in aseptic operative procedures repeated suppurations in the wounds. These seemed to have their origin in the suture punctures, and, in order to discover the cause, he made some 216 bacteriological tests of suture and ligature material. Out of these experiments were twenty-six tests of raw catgut, a number with silk and silkworm gut, and 149 with so-called sterilized catgut which had been prepared by the

different methods now in vogue. Among these samples of material tested were thirty-five which contained bacteria from which colonies could be made to develop. Of the 149 samples, 107 had been treated by dry heat. Twenty-nine of these contained germs capable of development. Most of them were the bacillus subtilis. They appeared in the various culture-media used,—gelatin, glycerin-agar, blood-serum, bouillon, alkali-albuminates. There were also found micrococcus tetragenus and the staphylococcus albus. Lauenstein came to the conclusion that no practical answer to this question could be given on the ground of his experiments and observations, and deduced the following:

(1) Clinical experience shows that cases of wound-infection occur which have their origin in the catgut used in the wound.

(2) The assumption that the catgut is always the source of this infection cannot be regarded as positive.

(3) The so-called sterilized catgut often contains the mischief-making germs.

(4) So long as these germs can be discovered in this catgut, so long will the suspicion remain that it is responsible for these cases of suppuration.

In discussing these observations, Kocher remarked that since 1888 he had used only silk. This can unquestionably be sterilized by either moist or dry heat, which is not the case with catgut. He spoke of his results in 900 cases of operation for the removal of goitre, in which he at first used catgut, but later came to use only silk. During the catgut period he secured but 35 per cent. of absolute *prima intentio*, whereas during the silk period the percentage of *prima intentio* was raised to 85.7 per cent. The 15 per cent. of reactive wounds he attributed not to the silk but to the air and the hands. He laid stress upon the value of having suture material not only aseptic but antiseptic as well. During the past year he had been boiling the silk in a solution of arsenious acid. In the thirty-five cases in which this silk was used, absolute primary healing was secured in 100 per cent.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXIV Kongress, 1895.

VI. The Treatment of Inoperable Malignant Tumors by Means of Bacterial Products. By DR. FRIEDRICH (Leipzig). These experiments were carrid on under the observation of Professor Thiersch. They had for their object a confirmation of the experiments of Coley, who reported five cases of sarcoma definitely cured by this method. He prepared his materials directly after the manner recommended by Coley and used them in the same way. He treated in this manner thirteen cases of real epithelial carcinoma and four cases of sarcoma. These latter consisted of one endothelioma, one osteofibrochondrosarcoma, and two lymphosarcoma.

Although, in the cases of carcinoma, there were many improvements of a subjective character, yet there was no such a thing as cure in an anatomical sense. In the case of the sarcomata the ultimate results were also not changed by the treatment. The improvement in one case, which lasted for a long time, encouraged the continuance of the experiments in other cases of sarcoma.

The local changes, following interstitial injection of the materials into the tumor tissue, were manifested by redness, swelling, slight œdema, and less pain. Often the injection was followed by more or less extensive necrosis of the tissues receiving the injection. In many cases the necrosis extended to the very base of the tumor. Metastases remained uninfluenced by the treatment. Subcutaneous injections often caused a flat area of red infiltration to appear, which was the size of a saucer, and which at the end of forty-eight hours had so nearly disappeared as to leave only a trace of pigmentation under the skin. It never went on to suppuration.

The general effect of pure streptococcus cultures was relatively unimportant. It was observed that a toleration for the injections was soon acquired, so that after a few injections the slight febrile reaction which was at first caused ceased to be observed. The results when mixed cultures were used (streptococci with bacilli prodigiosi) were very different. Here small doses caused severe attacks of fever with all the accompaniments of pronounced fever.

Besides the observations concerning the influence of these injec-

tions upon the tumors, the experiments gave an opportunity to study the artificial production of fever and the peculiarities of the progress of that symptom. The difference between streptococcus filtrate and sterilized toxine was shown in the course of the fever. The experimental production of herpes facialis was another of the interesting observations made. Aside from these things the experiments proved nothing.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXIV Kongress, 1895.

VII. How can the Syphilitic Sarcoma and Lymphoma be distinguished Anatomically and Clinically from other Sarcomata and Lymphomata? By F. VON ESMARCH (Kiel). It is a well-known fact that tumors not infrequently occur which are due to constitutional (inherited or acquired) syphilis, and which can be cured by proper internal medication. These tumors are easily confused with other malignant growths, and are often subjected to unnecessary operation and deprived of the medical treatment which would be sufficient to effect a cure.

Because of the difficulty of this diagnosis, Von Esmarch has brought out the points which will help to give these tumors their proper clinical place.

He has brought to bear upon this subject some forty cases which had been diagnosticated malignant tumor, carcinoma, or sarcoma, and which he was able to demonstrate to be unquestionably syphilitic in character.

A much larger number of such cases are to be found in medical and surgical literature, which can be regarded as incorrectly diagnosticated. Von Esmarch makes a classification of such cases,—

(1) All cases of tumors in which the patient has presented other symptoms of syphilis, or in which the anamnesis shows that the patient or his parents or sisters had suffered from syphilis.

(2) All sarcoma-like tumors which develop in voluntary muscle, especially in the sterno-cleido mastoid, in the muscles of the abdomen, of the back, and of the lower extremities, also in the tongue.

(3) All sarcomata which, after their complete removal, recur at first slowly and then rapidly (recurring fibroid tumors of Paget).

(4) All tumors which, after the use of iodide of potassium, mercury, and arsenic, became smaller or disappeared entirely.

(5) Those sarcomata which, after an attack of erysipelas or after the injection of erysipelas toxine, disappeared.

All of these "grounds for suspicion" are of much importance in the clinical diagnosis; and the more of these grounds met with in a given case, the more probable is it that the tumor is of syphilitic origin, the more positive must the surgeon be before he adopts operative measures, and the more thorough must be the examination of the entire body and the study of the history of the case. Very often careful study reveals important disclosures in the teeth, eyes, in scars or skin eruptions.

The outward appearance of the tumors is so variable that no diagnostic conclusions can be drawn therefrom.

The anatomical character of the growth, after its extirpation or judged from an excised piece, can often be determined even with the naked eye when the cut surface shows the peculiar variegated picture so vividly described by Virchow.

The microscopic examination often gives a valuable clue, especially in the negative direction.

But in many cases neither the microscopic nor the macroscopic examination shows a differential diagnosis between the syphiloma and small-cell or spindle-cell sarcoma. This is the case when an unconfined growth of granulation tissue takes place in the region of a gumma.

The greatest difficulty in diagnosis is encountered in cases of syphilitic lymphoma, which very frequently occur, especially as symptoms of hereditary syphilis, and are very often mistaken for other diseases, such as tuberculosis, pseudo-leukæmia, malignant lymphoma, and lymphosarcoma.

In other glands, such as the mamma, the testicle, and the salivary

glands, syphilis occurs, but is not diagnosticated as such till after its extirpation by operation.

Inasmuch as, after the removal of all of these tumors, recurrence occurs which rapidly leads on to death, it becomes of the greatest importance that some method be discovered, at least by microscopic examination, by which it may be decided whether the tumor is a syphilitic product or not.

There is little or no question, judging from the manner of infection and the entire course of the disease, that syphilis is due to bacteria or some similar organism. But unfortunately the researches of Lustgarten and Döhle have not yet determined beyond doubt that the particular organism which they have discovered is the cause of the infection, and as such is to be found in all syphilitic products.

Should this be accomplished, the greatest difficulty in the diagnosis of syphilis would be overcome.

JAMES P. WARBASSE (Brooklyn).

HEAD AND NECK.

I. Thrombosis of the Cerebral Sinuses following Suppurative Middle-Ear Disease. By A. JANSEN (Berlin). In a previous article (*Archiv für Ohrenheilkunde*, Vol. XXXV, Nos. 1 to 4) the author published thirty-four cases of thrombosis of the lateral sinuses occurring in the University Policlinic of Berlin from 1881 to 1892. Of these seven were operated upon, six of which were confined to the sinus, in the seventh the internal jugular was ligated without influencing the fatal termination. Three cases recovered after operation.

In the present paper Jansen adds twelve cases, of which nine were operated upon from the end of 1892 to December, 1893, with five recoveries. He has also collected thirty-one cases of other operators, of which fifteen recovered. Since January, 1894, as he remarks in a foot-note, he has operated six times on the lateral sinus with three recoveries, and in four cases has ligated the jugular with two recoveries.

A true picture of the conditions at the time of a possible operation cannot be obtained at the post-mortem examination, for this shows the terminal stage, a thrombosis of both lateral sinuses and jugular vein, whereas at the operation either the sinus is found free or the jugular can be kept free by the early removal of the thrombus from the lateral sinus. In nine of the twelve cases reported, there was thrombosis of the lateral sinus, in three cases combined with thrombosis of the jugular, in one associated with that of both cavernous and inferior petrosal sinuses and ophthalmic veins, also of the jugular of the same side. In five there was purulent thrombosis of the lateral sinus, all recovered after operation. In the remaining three cases there was purulent thrombosis of the superior petrosal sinus and of the jugular vein.

In consequence of earlier and more energetic interference, the author hopes in future to confine the thrombosis to the uppermost part of the jugular or the lateral sinus. In the former the acuter forms of suppurative middle-ear disease seem to be the principal etiological factor, in the latter the more chronic forms, and especially the desquamative. From these observations it results that in the majority of cases there is a thrombosis of the lateral sinus, frequently, also, one of the jugular vein. If at the time of operation the former should be free, one must first look for a thrombosis of the jugular and then for one of the petrosal sinuses.

The chief dangers resulting from these thromboses are, on the one hand, the pulmonary metastases, and, on the other, a suppurative meningitis.

In the thirty-four cases previously reported, there were seventeen in which the thrombosis extended to the jugular. Of these 76.5 per cent. showed metastatic lesions. Where the sinus alone was thrombosed there were metastases and sepsis in only 35.3 per cent. In the cases of thrombosis of the petrosal sinuses the danger is even less, 30 per cent. Thirteen of the thirty-four cases showed suppurative meningitis. Under the influence of more radical treatment, as shown in the twelve cases which form the basis of the present article, the fre-

quency of suppurative meningitis as compared with the previous thirty-four cases has been reduced from 38 to 9 per cent., but that of metastases only from 76.5 to 62 per cent., in the cases in which the jugular was also thrombosed. In the remaining three cases of lateral sinus thrombosis only once a slight metastasis in the shape of a phlegmon of the hand was observed.

The author divides the symptoms into general and local. He has also observed cases of pure thrombosis of the lateral sinus, in which the thrombus was either not purulent or, if so, had no communication with the general circulation or meninges. In such cases, after the evacuation of an abscess situated around the sinus, there were either no further symptoms or, if any, only a headache.

The chief symptoms are: pyæmic and septic fever with chills, then metastases; optic neuritis; symptoms of meningeal irritation; symptoms caused by the extension of the thrombus to the jugular, cavernous sinuses, mastoid vein, and torcular Herophili, but especially by the perisinuous abscess.

The majority of cases of chronic suppurative middle-ear disease, especially the desquamative (cholesteastom.), show no increase in temperature, the more acute do. But this is usually decreased at the time at which a thrombo-phlebitis is likely to occur. Hence a pyæmic form of fever, and especially repeated chills, must act as a warning, in such cases, to look out for thrombosis of the sinuses. In 53.5 per cent. of forty-three cases collected by the author from the literature of the subject at the time he wrote his first paper, there was choked disk present. In his first series of cases it was present in 35 per cent., and of these the majority were complicated by extradural abscesses. In his present twelve cases it occurred in only three,—*i.e.*, 25 per cent.,—and these were all cases of thrombosis of the lateral sinus. The meningeal symptoms are vertigo, restlessness, nausea, rigidity of neck, and stupor. They should serve as a last warning to operate.

When the thrombosis extends towards the jugular, the symptoms are better marked. Pain on swallowing, on movement of head,

swollen glands, and a feeling of resistance along the vein. Still more characteristic are those of thrombosis of the cavernous sinus,—swollen lids, and, later, exophthalmos. That of the mastoid vein shows itself in swelling and tenderness on pressure over the region behind the mastoid. The frequency of the occurrence of abscesses around the sinus is shown by the fact that in three and a half years the author observed this condition thirty-one times in thirty-five cases of thrombosis of the lateral sinuses. The symptoms of these abscesses, in addition to those of general cerebral compression, are an area behind the externally intact mastoid process over which distinct swelling and pain on pressure exist. In general, a profuse discharge of pus from the ear, when the mastoid is intact, must lead one to suspect suppuration around the sinus. When, in addition to these symptoms of a perisinuous abscess, one finds a pyæmic form of fever and chills, one can scarce err, in diagnosticating a thrombosis of the lateral sinus. In general, if one does not find sufficient cause in the mastoid for the symptoms, one should always search for an extradural abscess. These occur most frequently in cases in which, owing to the thickness and sclerosis of the mastoid process, the pus is compelled to seek an outlet in the posterior fossa of the skull.

The prognosis depends upon the early diagnosis of the presence of an abscess around the sinus and its evacuation, for by this means one may prevent the formation of a thrombus, or, if one has formed, hinder its becoming purulent. The earlier the thrombosis of the lateral sinus is operated upon, the more favorable the prognosis. Inspection and palpation of the sinus may enable one to make a diagnosis when every other means fails. Resistance of the wall, gangrenous or fistulous areas are of greater value than the absence or presence of pulsation.

As to the justifiability of an operation down to the sinus, the author's cases show plainly that such a measure is of the greatest value. Of forty-five cases of thrombosis twenty-nine were not operated down to the sinus, of these only two recovered. The remaining sixteen, in which the sinus was opened, showed eight recoveries. Oper-

ation is as urgently demanded as in strangulated hernia. Hæmorrhage can be checked by tamponnade. Towards the jugular one should not go to the end of the thrombus. We remain ignorant of the fact whether the thrombosis extends far into the jugular or whether metastases will follow. If the uppermost portion of the jugular is thrombosed, there is danger of its spreading to inferior petrosal and cavernous sinuses. This danger is not decreased by ligation of the jugular, rather increased.

As regards the ligation of the jugular, in every case the author differs from the majority. He considers it unnecessary, basing his opinion upon two cases in which, after ligating the jugular at the level of the cricoid, pulmonary metastases appeared.

If the operation on the sinus is confined to evacuating the puriform thrombus and not touching the firmer one, which the author has always observed towards the cardiac side, ligation is not needed. In the cases in which thrombosis of the jugular is diagnosticated, ligation is indicated.

Of thirteen cases treated by opening of the sinus alone 61.5 per cent. recovered; in three the jugular was also ligated with no recoveries.

The method of operation employed by the author is to make a vertical or rectangular incision to the bone. He then chisels into the posterior fossa of the skull until the sinus and dura are laid free. He prefers the chisel to the bone-cutting forceps. He opens the sinus as far as the thrombus is softened and excises its wall. After dusting the wound with iodoform powder, he packs it with iodoform gauze. Daily change of dressings. Should the temperature continue high and chills not disappear, it is best to ligate the jugular and facial veins, opening up the former to the base of the skull.

The remainder of the article takes up the cases in detail, the results of which have been given above; several points of especial interest not treated of in other portions of the article are brought out here. In one case in which the sinus was opened, the choked disk increased in intensity in spite of the fact that no further thrombosis

occurred. In a second, in which there was thrombosis of both sinus cavernosi and of the ophthalmic veins, there was no choked disk.

In several cases, after ligation of the jugular, the thrombus above rapidly became purulent, so that he advises immediate opening of the vein to the base of the skull.—*Sammlung klinische Vorträge*, No. 130.

D. N. EISENDRATH (Chicago).

II. Intracranial Resection of the Trigeminal Nerve. By DR. BERNHARD V. BECK (Heidelberg). Three cases have been operated upon by Professor Czerny according to Hartley's method. One case was complicated by profuse hæmorrhage, so that the wound had to be packed and the operation finished two days later. Some necrosis of the bone took place and prolonged the recovery. A large secondary hæmorrhage took place in another case necessitating opening of the wound and packing with gauze. The ultimate result was good in all of the cases. Headache and neuralgia from pressure on the central end of the nerve was noted in some cases after operation, but were not of long duration.

The nerves leave the ganglion as loose bundles of fibres embedded in the substance of the dura mater, and have to be dissected out with great care, especially the first branch, which is embedded in the wall of the cavernous sinus and is in close proximity to several other nerves.

After cutting the nerve there results anæsthesia of one side of the face; paralysis of the muscles of mastication, with atrophy of these muscles, followed by asymmetry of the jaw, deafness on one side due to paralysis of the tensor tympani, and œdema of the face. The sensibility gradually returns, beginning first at the periphery and extending towards the centre of the anæsthetic area.

Usually, it is not necessary to remove the entire three branches, as the pain is frequently caused by the first and second.—*Beiträge zur klinische Chirurgie*, Band XIII, Heft 3.

G. R. WHITE (New York).

ABDOMEN.

I. Healing of Tubercular Peritonitis after a Laparotomy. By DR. MAX JORDAN (Heidelberg). The proposition to open the abdomen for tubercular peritonitis was made by König in 1884, and soon became a recogniżed practice. The latest statistics relating to the operation are those of Roersch, which present 358 operated cases. Of these 20 (5.59 per cent.) died as a result of the operation; 51 died a few weeks later of other tubercular trouble, and 250 (70 per cent.) were cured. One hundred and eighteen were kept under observation six months or more, 79 a year, and 53 two years or longer. The statistics also show that suppurative and plastic forms of peritonitis are also cured by an operation, although the prognosis is better in those cases accompanied with serous exudate only.

The author reports a unique case of plastic tubercular peritonitis in the sack of an incarcerated hernia. The hernia could not be reduced at the time of operation, but one year later the tubercular process had disappeared and reduction by taxis was easily effected.

The paper is summed up as follows:

(1) The reason of the cure of tubercular peritonitis after an operation is still unknown, none of the numerous theories are satisfactory.

(2) A complete cure takes place after a laparotomy and the peritoneum returns to a perfectly normal condition.

(3) The *restitutio ad integrum* is the result of the absorption of the tubercular tissue.

(4) The formation of adhesions is not necessary in order to bring about a cure. In many cases none are formed.

(5) Clinically the patients may not be cured when they are well from an anatomical point of view.

(6) The patients should not be considered cured until a long time (years) after the operation.

(7) Peritonitis sicca is also curable by a simple abdominal incision. The adhesions become absorbed and the peritoneum returns to a normal state.—*Beiträge für klinische Chirurgie*, Band XII, Heft 3.

II. Actinomycosis of the Stomach and Intestines in Man. By Dr. A. Grill (Tübingen). A unique case of actinomycosis of the stomach is reported, also two cases of actinomycosis of the intestines, and an analysis is made of 107 cases collected from literature. The results of his observation may be summed up as follows:

Frequency.—Although knowledge of actinomycosis of the abdomen is of a recent date, it is now found to be the most frequent seat of the disease next to the head and neck.

Etiology.—The disease cannot be produced by feeding the fungus to animals, but requires an abrasion somewhere in the intestinal tract. It is probably often produced by swallowing uncooked grain. The sharp edges of the grain wound the mucous membrane and allow the germs to enter. Only 20 per cent. of those affected with the disease have to do with cattle, so that the disease is probably not given directly by animals, but it is probable that animals and man are affected from a common source.

Men suffer from the disease twice as often as women, and adults much more frequently than children.

Pathological Anatomy.—No disease of the abdomen causes so widespread destruction, due partly to the inflammatory action about the disease and partly to the extensive suppuration from mixed infection. Any part of the intestines can serve as a starting-point for the disease, but the region of the ileo-cæcal valve is most frequently affected. If the disease start from the colon, the suppuration is usually retroperitoneal, while abscesses of the abdominal wall are usually formed when the site of the lesion is in some part of the intestinal tract which has a mesentery. The process spreads by involving contiguous structures, but not infrequently metastatic deposits are found in the liver or other organs. The spores are never carried by the lymphatics, owing to their large size.

Clinical Picture.—The time of the infection in a case of abdominal actinomycosis has never been determined. The clinical picture of the disease is exceedingly various, but three stages can be distinguished:

(1) *Beginning Stage.*—This is characterized by numerous indefinite symptoms referable to the abdomen,—diarrhœa, constipation, and pain. The symptoms sometimes simulate appendicitis, and have led to an operation in a few cases.

(2) *Stage of Tumor Formation.*—The first diagnostic sign is the presence of a tumor in the abdominal walls, most frequently in the ileo-cæcal region. The tumor has an inflammatory appearance, but is seldom painful. It gradually increases in size, and if not incised it breaks through the skin and discharges a quantity of pus.

(3) *Stage of Suppuration and Formation of Fistulæ.*—When left to themselves the tumors break and discharge externally, leaving behind deep fistulæ which do not heal readily, and new ones are constantly forming. There is nothing characteristic in the appearance of the pus from the fistulæ, but the microscope shows the presence of fungi, and they may also be found in the walls of the fistulæ.

The prognosis at first was thought to be absolutely bad, but more recent observations show a number of recoveries. Among seventy cases, forty-five died, twenty-two were cured, and ten were improved. The prognosis is best in those cases in which the abdominal wall is involved early and the abdominal viscera are not extensively involved.

The treatment consists in opening all tumors and fistulæ freely, and scraping them out. It is probable that the mixed infection has a tendency to prevent the growth of the fungus.—*Beiträge zur klinische Chirurgie*, Band XIII, Heft 2.

G. R. WHITE (New York).

III. A Case of Perforated Gastric Ulcer successfully treated by Abdominal Section. By ROBERT C. KIRKPATRICK, M.D. (Montreal). A woman, aged twenty-four years, was admitted into the Montreal General Hospital on November 17, complaining of "pain in the abdomen and shoulders," having been seized on November 15 with severe pain in the epigastrium and lower substernal regions, which caused her to suffer intensely, and along with this she vomited "dark-colored" material for several hours. The condition,

except for additional pain felt in the shoulders, continued thus unabated in spite of treatment, and she entered the hospital on November 17.

When seen first after admission she was lying in bed in the dorsal position, with her legs drawn up, moaning, and in great distress. Her face was pallid and lips dry. She complained of pain in the abdomen, particularly in the epigastric region and in the shoulders, especially the left. She had no inclination to vomit. The abdomen was prominent and rounded and evenly distended. There was tenderness generally, but particularly marked in the epigastric and innermost portion of the right hypochondriac regions. Tenseness of the abdominal walls was not great, and not more marked in any special region. No evidences of tumor in any situation. Percussion revealed a general tympanitic note, which mounted up and completely obscured the liver dulness.

As the patient did not improve during the night, on the following day an incision was made from the ensiform cartilage to within a short distance of the umbilicus. On opening the peritoneum a small quantity of gas escaped and the anterior wall of the stomach presented. This was found to be attached to the parietes by slight adhesions, which were easily broken down by the fingers. While continuing the breaking down of the adhesions, a hole in the stomach came into view. The stomach was drawn up through the wound and examined. The ulcer was situated in the anterior wall of the stomach, a little to the right of the œsophageal line, and more towards the superior than inferior gastric border. The opening was a little larger than a five-cent piece, and was closed with a continuous Czerny-Lembert suture after trimming the ragged edges with a pair of scissors. The Lembert suture was continued for about half an inch towards the median line in order to invert a portion of stomach wall that looked as if ulceration might be going on inside. The abdomen was then sponged out, a rubber tube inserted into the right flank, and the edges of the incision brought together by through-and-through stitches of silkworm gut. Irrigation of abdomen was not used.

During the operation the patient's pulse became very weak, but on being put back to bed she came quickly out of ether, with little pain or vomiting. The pulse improved quickly, stimulation being required on only one occasion, when strychnine $\frac{1}{60}$ gr. was given. Exudation was very slight, only ℥ iss clear fluid coming away, so that the drainage-tube was removed on the following morning, after twenty hours. All food by mouth was prohibited at first, patient's strength being maintained by nutrient enemata of beef-tea and peptonized milk. On the third day small quantities of milk were given by the mouth. The wound was dressed on November 23, and again on December 3, when the stitches were removed. The wound healed by first intention. Slight suppuration occurred in the upper part of the incision, and a small sinus appeared five weeks after the operation.

The patient sat up, out of bed, on December 19, and since then her general health has been improving steadily. The temperature was normal on the thirteenth day following the operation. The sinus has now healed and the patient is perfectly well.—*Montreal Medical Journal*, March, 1895.

IV. Contribution to the Surgery of the Gall-Bladder. By Dr. F. Mermann (Heidelberg). The author reports twenty-five operations on the gall-bladder done at the Heidelberg Clinic, mostly by Czerny. The most frequent indication was gall-stones usually in the cystic duct, less frequently in the gall-bladder or common duct.

In treating a case of cholelithiasis internal medication should not be kept up too long. If no improvement takes place after a thorough trial, the sooner the operation is performed the better, since suppuration, perforation, and cancerous degeneration are not uncommon results of prolonged retention of stones.

Cholecystotomy with immediate suture of the wound and dropping the gall-bladder back into the abdominal cavity is the ideal method, and can be used when the gall-bladder is but little abnormal and the contents are not septic. The prognosis after this operation is good.

Cholecystectomy should be performed only in cases of deep ulcer of the gall-bladder or cancerous degeneration.

For stones in the common duct an incision should be made over the stone which is to be removed and the incision closed, provided that it is not possible to push the stone into the bladder or intestine.

Cholecystenterostomy is to be done for obstruction to the common bile-duct caused by something other than a calculus and those cases of calculi which cannot be removed. Murphy's buttons were not used in any of the cases reported, but Marwedel has used them several times, and will report the results in a subsequent paper. In cases not suitable for any of these operations, a biliary fistula is made at one sitting. The fistulæ thus formed usually heal readily in from six to ten weeks, and seldom require a secondary operation.

A recurrence is very rare after any of the above operations.—*Beiträge zur klinische Chirurgie*, Band XIII, Heft 2, 1895.

V. Intestinal Obstruction from Gall-Stones. By DR. E. LOBSTEIN (Heidelberg). Two new cases of intestinal obstruction from gall-stones are reported, together with ninety cases gathered from literature. Of the sixty-one of these cases not operated upon, thirty-two recovered after the passage of one or more stones with the fæces; the remaining twenty-nine died of perforation, peritonitis, or exhaustion. Of the thirty-one cases operated upon, twelve recovered, nineteen died; but as many of the fatal cases were operated upon when moribund, their death should not be charged to the operation.

The stones are usually oval in shape and from five to seven centimetres in length. They most frequently reach the intestines by direct communication with the gall-bladder, but occasionally pass through the common duct. The passage of the stone into the intestine is usually painless, only seventeen of the ninety-two cases presenting premonitory symptoms before the obstruction occurred. The stone seldom remains at the point where it entered the intestine, but passes downward and most frequently stops in the lower part of the ileum. Czerny claims that obstruction rarely occurs until the stone has passed into the pelvis and formed there an angulation of the intestine.

The disease occurs more frequently in women between the ages of forty and sixty.

The symptoms for the most part are those of acute obstruction with severe abdominal pain and early fæcal vomiting. One is seldom able to feel the stone through the abdominal walls.

The medical treatment consists of rest, the free use of opiates, avoidance of cathartics, washing out of the stomach, and warm-water enemata. Rarely massage over the tumor is effective. The strength of the patient should be kept up by giving milk and brandy at frequent intervals and nutrient enemata.

Operation should not be too long delayed if other means fail to give relief. The abdomen can be opened in the median line, the intestines examined systematically until the obstruction is found. If the stone be movable, it can be pushed along until it enters the large intestine; otherwise, it should be removed through a longitudinal incision and the wound closed by two rows of sutures.—*Beiträge zur klinische Chirurgie*, Band XIII, Heft 2.

VI. Inguinal and Crural Properitoneal Hernias. By DR. W. BREITER (Zürich). Since Krönlein's paper, in 1880, a number of properitoneal herniæ have been reported, mostly in Germany. The author has gone over the literature in order to bring the subject up to date. The histories of forty-five cases are given. They are divided into three classes: those in which the diagnosis was certain, those in which it was doubtful, and those in which it was incorrect.

Statistics.—Inguinal properitoneal herniæ are much more frequent than crural. The author reports 35 cases, which with Krönlein's 23 cases makes a total of 58. Of these 56 were men, 2 women; 36 had congenital hernia, 10 acquired hernia, and 12 unknown. Undescended testicle of greater or less degree was noted in 23 of the 56 cases. In only 10 of the remaining cases was it expressly stated that the testicle was normal. Nearly all are incarcerated. In only one of Krönlein's cases the hernia was reducible.

Symptoms.—The characteristic symptoms of a properitoneal inguinal hernia are the presence of an incarcerated hernia, associated with a tumor, tympanitic on percussion, situated above and parallel to Poupart's ligament. Pressure on the outer sac causes the inner one to increase in size. In a large number of cases the presence of the internal sac cannot be made out owing to the thickness of the abdominal walls, or its location back of the pubic bones.

The external and internal sacs have a common opening into the peritoneal cavity, and the constriction is usually situated at this point in cases of strangulation.

Diagnosis is important and can usually be made by the presence of two tumors, one in the scrotum and the other parallel to Poupart's ligament, so connected that emptying one causes the other to fill. These herniæ are usually of long duration, most frequent on the right side, and often associated with an undescended or late-descended testicle. They are usually irreducible except by reducing the outer sac into the inner one.

Etiology.—The different views as to the causation of these herniæ may be summed up as follows:

(*a*) The inguinal hernia develops first, and the properitoneal sac is formed by a diverticulum caused by frequent attempts at taxis when there is a stenosis at the internal ring, or by a badly-fitting truss, or an undescended testicle.

(*b*) During an attempt at taxis the entire sac is forced between the peritoneum and transversalis fascia.

(*c*) The properitoneal sac develops first and the external sac secondarily.

(*d*) The two sacs are independent at first, but join subsequently.

Schmidt claims that these herniæ are due to a congenital malformation of the inguinal canal. The gubernaculum testis is attached too far externally, and the inguinal canal formed under these conditions runs a considerable distance under the peritoneum, but does not reach the external ring, and descensus of the testicle does not take

place or is delayed. When a hernia takes place in these cases the properitoneal sac is formed by that portion of the canal between the abdominal opening and the internal ring.

Properitoneal crural herniæ are much less common than the inguinal. Only ten cases are recorded, and in these the diagnosis was made but twice before the operation.

Treatment.—Owing to the high mortality, herniæ with undescended testicles should always be kept up with a truss. If one of these herniæ be diagnosticated and it cannot be reduced and held up with a truss it should be operated upon without delay. There is nothing special about the operation except that it must be remembered that the constriction is not at the internal ring, but at a point higher up. The loop of intestine should be pulled upon until the constricting ring comes into view. In a few cases it is necessary to do a laparotomy before the point of constriction can be reached.

Prognosis.—The mortality after operation on inguinal properitoneal herniæ is 34 per cent., and 50 per cent. in crural herniæ. In recent years there has been much lower death-rate than these figures indicate.—*Beiträge zur klinische Chirurgie*, Band XIII, Heft 3.

GEORGE R. WHITE (New York).

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COMPARATIVE FREQUENCY OF STONE IN THE BLADDER IN THE WHITE AND NEGRO RACES.

By GEORGE BEN JOHNSTON, M.D.,

OF RICHMOND, VA.

IT is commonly stated by writers on urinary diseases that stone in the bladder is of rare occurrence in the negro race.

This is so at variance with my own experience that I have instituted an investigation either to prove the statement or to correct the fallacy.

Those in our own country who have mainly written on stone have resided chiefly in sections where the negro is scarce, and have had no personal knowledge of his diseases. Their statistics have been drawn from a few reporters who have chronicled unusual numbers of cases. Hence their conclusions are based upon improper information and are misleading. To ascertain with as much accuracy as possible the real ratio of stone between the two races, I have procured extensive reports, and these lead to a contradiction of this heretofore unchallenged utterance. I have avoided, except in one instance, the use of published cases and endeavored by a painstaking method to collect material from which to adduce my own conclusions.

I selected the Southern States of Virginia, North Carolina, South Carolina, Alabama, Georgia, Tennessee, Kentucky, Florida, Louisiana, Mississippi, Arkansas, and Texas as the field of inquiry.

I chose by careful methods 400 representative practitioners to correspond with in order to procure the necessary data. To each of these I sent a personal letter and a sheet of questions. I received 338 responses. Ninety-four contained information and the remainder were negative. I succeeded in collecting 1068

cases of stone in the bladder. Of these 952 were in white subjects and 116 in negroes. It is at once observed that the negro cases represent 9.55 per cent. of all cases reported.

It is not denied that stone is less frequent in the negro than in the white, but the disparity is not so great as even these figures would indicate. The United States census for 1890 fixes the total population of the States enumerated at 17,464,580. Of these, 11,169,598 are whites and 6,415,336 are blacks. This gives us a stone to every 16,352 persons, the ratio of stones in the whites being one in every 11,732, and in the blacks, one in every 55,305. Thus it appears that stone is only 4.72 times more frequent in the whites than in the negroes.

This showing is quite sufficient to disprove the idea of immunity which the negro is supposed to enjoy, and is borne out by statistics collected by Dr. F. L. Parker,[1] of Charleston, S. C. Dr. Parker by most diligent and laborious efforts succeeded in collecting histories of 132 cases of stone occurring in South Carolina between the years of 1825 and 1879. Of these, 102 were in white subjects, and 20 in blacks, thus exhibiting a larger percentage of blacks ($15\frac{5}{8}$) than my cases show, and I have no doubt that if equally accurate statistics could be gotten from all of the Southern States that this rate would be the proper one.

It is nevertheless evident, from the large number of faithfully reported cases I exhibit, and a study of Dr. Parker's cases, that stone in the bladder is by no means uncommon in the negro.

Although not entirely relevant, there are some facts developed by my inquiries which are interesting and worthy of mention. Geographically these stones were distributed as follows:

Alabama	10
Arkansas	11
Florida	28
Georgia	90
Kentucky	56
Louisiana	19

[1] Transactions of the South Carolina Medical Association, April, 1879.

Mississippi	6
North Carolina	126
South Carolina	66
Tennessee	128
Texas	98
Virginia	430

It will be observed from this table that some States are peculiarly exempt from calculous disease, notably Mississippi, Arkansas, Alabama, Louisiana, and Florida. "Stone is extremely rare in this section," is an expression found in numbers of letters from my correspondents in these States. Although the five States alluded to have an aggregate population of 5,340,805, or a little more than one-third of the population of the twelve States studied, they supply only 74 cases of stone, or but 8 more than South Carolina alone, while Virginia furnished nearly six times their number.

Sex is specified in 788 cases, and not stated in 280; 691 in males and 97 in females, or about seven times oftener in males than in females.

There were 182 cases not subjected to operation, and 584 in which the stones were removed by the following methods: lateral perineal, 249; median perineal, 100; suprapubic, 138; vaginal incision, 32; dilatation of female urethra, 28; crushing, 35; operation not given, 5. Of those operated on 541 recovered and 43 died. No report of operation in 304 cases.

My own cases are incorporated in the foregoing statistics. During my twenty years in practice I have made notes in 41 cases, which is the third largest list furnished by any reporter, and what seemed to me the enormous number of cases in the negro in the face of its supposed rarity, caused me to set on foot the inquiries leading up to this paper.

I have records of 41 cases. There were in whites, 35; in blacks, 6; in males, 39; in females, 2; 39 were operated on and two were refused operation on account of advanced kidney disease. Both died.

In 25 cases lateral perineal lithotomy was done, in 12 suprapubic, and in the cases of the 2 females the urethra was dilated and fragmentation practised.

I have had no deaths following operation.

TWO CASES OF INTRAPERITONEAL SUPRAPUBIC CYSTOTOMY FOR STONE.

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THE choice of operation for stone in the male bladder has acquired renewed importance now that asepsis has diminished so greatly the mortality of the cutting methods. Litholapaxy is certainly not suited to all cases, neither is perineal lithotomy nor suprapubic cystotomy. Perineal drainage is so valuable a supplement to the removal of calculi from foul and inflamed bladders that lithotomy should be selected when such conditions exist. This method is preferable, too, when there is good reason to believe that the fragments cannot be entirely removed by the evacuator or when the calculus is partially encysted. Not that it is easy or even possible always to tell when the lithotrite will fail to find the last piece of stone, or when the evacuator will leave undetected a nucleus for further trouble. That a stone may remain encysted and undetected, or that a new calculus may form upon an undiscovered fragment (both of which conditions I have met) are facts that furnish the strongest arguments in favor of perineal or suprapubic lithotomy, arguments that would have prevailed but for the hitherto greater danger of the latter methods. Lithotomy is generally to be preferred in children also, in whom rapid crushing and evacuation may be attended by unusual difficulties. In other cases, when there is no occasion for drainage, when the fragments can be quickly and thoroughly removed, and when there is no serious difficulty in the management of the instruments, the operation of Bigelow is still, in my experience, far preferable.

In certain cases, however, neither litholapaxy nor perineal lithotomy can be performed, owing to the great size of the stone. In litholapaxy such a stone either cannot be grasped or the presumably contracted and friable bladder wall will be too seriously injured in the necessarily prolonged sitting to justify such a method. After perineal incision such a stone must be broken before it can be delivered; moreover, the large angular fragments may cause quite as much local damage as litholapaxy. Under such circumstances suprapubic cystotomy promises the most satisfactory results with the least risk. Unfortunately, this operation must be performed in such cases under peculiarly disadvantageous conditions, for by the time the stone has attained its great size the bladder may have undergone changes which make an extraperitoneal operation practically impossible.

The prevesical space in the healthy bladder can be made to reach high enough above the pubes to permit the removal of the largest stone or the most extensive tumor without opening the peritoneal cavity. By distending the bladder with air, even without distending the rectum, the line of peritoneal reflection can be seen to rise fully a hand's breadth above the pubes. The importance of this fact in suprapubic operations upon the bladder is great, and the necessity to the student of surgery of an intimate knowledge of the normal and of the abnormal extent of the prevesical space and of its relations can hardly be overstated, especially at a time when suprapubic puncture of a bladder presumably foul is so universally advised as a temporary measure in impermeable strictures.

But if this space is so broad in the healthy individual, it may be so limited by disease that the peritoneal reflection is actually behind and below the pubes. The condition which may practically obliterate this prevesical space is exactly that which makes a broad one desirable,—an inflamed bladder permanently thickened and contracted upon a large stone, upon an hypertrophied prostate, or perhaps upon a tumor. Not that an hypertrophied prostate is always accompanied by a contracted bladder, for there is occasionally great distention, but at times a small and thickened bladder is found firmly contracted upon a middle lobe so as to hold but a few drachms of urine at a time.

It is of the utmost importance, therefore, to have a good working space in this region free from risk of contaminating the peritoneum, in just these conditions in which, unfortunately, such a space is likely to be most limited, and in which, in addition to the dangers of the operation itself, incisions or punctures of the bladder are attended by the great liability to peritoneal infection from septic urine,—namely, in cases of unusually large stones, of hypertrophied prostates, and of tumors.

It does not follow, however, that a fatal or even a serious peritoneal infection will take place during intraperitoneal operations upon a foul bladder, as the following two cases will show, but they are presumably more likely to occur than during extraperitoneal explorations. Yet additional experience may show that with thorough precautions the intraperitoneal route may be quite as safe as the extraperitoneal, especially in view of the increased facility of exploration, the absence of lacerations, and the freedom from the cellular tissue infections so often seen by the prevesical route. Indeed, the only case of suprapubic cystotomy that I had performed previous to the two herewith reported died from extensive infection and necrosis of the cellular tissues about the bladder and kidneys, although the operation was extraperitoneal, performed for a tumor of the base of the bladder.

Dr. Frank B. Harrington, of Boston, one of my colleagues at the Massachusetts Hospital, published in the ANNALS OF SURGERY in 1893, Vol. XVIII, p. 408, a paper "On the Feasibility of Intraperitoneal Cystotomy, with a Report of a Case," in which he advocated the intraperitoneal route for "tumors of the bladder, for enlarged prostate, for disease of the ureters, for cases of stone of great size, and for sacculated stone." His method is to open the peritoneal cavity from the umbilicus to the prevesical space, but not opening the latter, to protect the intestines with gauze packing, and to open the bladder freely through its upper and, if need be, its posterior walls. In this way, with the patient in the Trendelenburg position, a most satisfactory view of the bladder can be obtained. The bladder should be washed daily for several days with a saturated solution of boric acid. During

the operation the flow of urine from the ureters can be easily removed by means of gauze. The bladder wound is to be closed by a double row of sutures, either the Lembert or the continuous right-angled. The advantages claimed by Dr. Harrington for the method are the great facility of exploration and inspection, and the ease by which the prostate, tumors, and even sections of the vesical wall can be removed. By the usual suprapubic incision the space is small, and inspection, exploration, and operative manipulations are limited.

In the following two cases there was no intention or expectation of opening the bladder intraperitoneally. This route was taken accidentally, or, more properly speaking, necessarily, because in each case the bladder was and had been so firmly contracted upon the stone that there was no extraperitoneal space whatsoever above the pubes. The cut opened the peritoneal cavity immediately, although as much fluid had been injected into the bladder as was thought safe. Indeed, in the first case this fluid had escaped from the cavity of the bladder, and was extravasated under the vesical peritoneum.

Case I.—F. H. G., aged fifty-one years, shoemaker, entered the Massachusetts General Hospital April 9, 1895, with a history of stone in the bladder of five years' duration. On account of great sensitiveness and pain, the bladder was not sounded until he was etherized for operation, April 11. The sound passed over what seemed to be a broad, calculous surface. Preparations were therefore made for Bigelow's operation. The bladder was distended by two or three bulbfuls (Davidson's syringe) of a two-per-cent. solution of boracic acid. By means of this amount of fluid the bladder was distended so as to be felt above the pubes. The amount of fluid was about a third of that usually employed for purposes of litholapaxy. A larger quantity of boric acid solution was not injected because of the unusual resistance met with in pressing the bulb. The stone was so large that it could not be grasped with the largest size Bigelow lithotrite. The crushing operation was, therefore, immediately abandoned. The suprapubic route seemed clearly to be the more favorable one for the removal of so large a stone. The abdomen was thereupon carefully prepared for suprapubic

cystotomy. The rectum was moderately distended by means of the colpeurynter. The fluid already injected into the bladder was drawn off and about eight ounces of fresh solution injected. A median incision was then made just above the pubes. No prevesical space was found, the presenting surface of the bladder being covered by peritoneum reflected from the posterior upper surface of the pubes. The peritoneal surface of the bladder was smooth, glistening, soft, and œdematous; it resembled so strongly a coil of small intestine that I was at first deceived. Careful examination showed this surface to be the outer wall of the bladder distended to the thickness of half an inch by recent extravasation from the interior. By downward pressure upon these softened and œdematous tissues, the fingers came upon the firm and distended muscular wall of the bladder. The evident rupture of the mucous and muscular walls by a distention which I deemed very moderate, a distention totally inadequate for litholapaxy, seemed at the very beginning of the operation to affect gravely the prognosis. The suprapubic incision, therefore, appeared the best means of giving suitable drainage to an extravasation which, though largely composed of boric acid solution, had come from an extremely foul bladder, and which seemed likely, therefore, to produce extensive connective-tissue necrosis. The absence of a prevesical space made an extraperitoneal operation upon the bladder impossible in this case. It was necessary, therefore, so to plan the incision into the bladder as to avoid as far as possible peritoneal contamination. The abdominal cut was extended towards the umbilicus until a clear view could be obtained of the superior and posterior bladder wall. Sterile gauze, in abundant folds, was packed behind, above, and to the sides of the bladder. The fundus was then fastened into the wound, as high as practicable, by a few silk sutures, which brought the skin together in the centre of the wound. A space about three inches in height above the pubes was thus made practically extraperitoneal. The escape of fluids into the general peritoneal cavity between the abdominal wall and the bladder was provided against by means of the gauze adjusted as above described. Through the presenting surface of the bladder, just above the pubes, a free incision was made into the interior. As soon as the œdematous peritoneum was incised, it was evident that this fluid had escaped from the interior of the bladder. Indeed, practically, all the fluid injected had thus escaped, for the stone was found tightly grasped by the firm contractions of the muscular wall. In spite of as long an incision into the bladder

as the space above the pubes allowed, the stone was not delivered without more or less local laceration. The weight of the calculus (Fig. 1) was 2250 grains. The mucous surface of the bladder was thickened, reddened, velvety, and tender, and bled profusely after the extraction of the stone. No ulceration of the mucous surface could be detected. After being carefully irrigated and dried, the interior of the bladder was packed with sterile gauze. The gauze barriers, which had been more or less contaminated by the escape of fluids from the bladder during the operation, were then removed from the upper half of the abdominal cut. The pelvis and the posterior bladder wall were then carefully cleansed and dried. A light gauze packing was left in the recto-vesical fossa. My senior house-surgeon, Dr. Houghton, by means of oiled silk and collodion, devised an ingenious and effectual contrivance for keeping the two parts of the wound separate.

During the manipulations of the operation, the general cavity of the abdomen was but little soiled. The septic fluids which must have passed the provisional sutures were immediately absorbed by the gauze.

Convalescence, without peritoneal complications, became established in the course of a few days. The gauze in the bladder absorbed the urine as fast as it was made, and drew it into the dressings, which were frequently renewed. At the end of four days the gauze was removed entirely from the bladder and a catheter substituted. The gauze was removed from the recto-vesical fossa in the course of forty-eight hours, and the upper portion of the abdominal wound closed. In eight days the stitches were out; in nine days the catheter was inserted through the urethra; in a month the whole suprapubic wound was healed. Drainage through the urethra was omitted on June 22, and the patient was discharged well on the 28th.

Case II.—G. T. W., aged fifty-one, upholsterer, a patient of Dr. C. B. Belt, of South Boston, had his first symptom of cystitis three years ago. He never had had gonorrhœa. The urine was first thick, then foul smelling, an finally bloody. Micturition became frequent and difficult, accompanied by much straining. He was obliged finally to give up work, and was at the time of my first examination (May 29, 1895) in a critical state of exhaustion.

He entered the Massachusetts General Hospital, where, on the following day, under ether, I found a stone too large to be easily grasped by the lithotrite. The prolonged manipulations of litholapaxy, in a patient so reduced in strength, seemed hardly justifiable

in view of the great rapidity and comparative safety of the cutting methods. The extensive lacerations incident to a perineal lithotomy seemed to contra-indicate that route. The patient was therefore prepared immediately for a suprapubic cystotomy. The bladder was washed out thoroughly by means of a 2-per-cent. solution of boracic acid. As in the previous case, the injection into the bladder of small amounts of fluid was accomplished only by a pressure which seemed hazardous. The rectum was distended moderately therefore by means of a colpeurynter. A median incision was made close to the pubes. Thinking that in the previous case the prevesical space might have been overlooked, I made in this case a most careful dissection, hugging closely the symphysis pibes. In spite of every care, however, the knife went directly into the abdominal cavity. The reflection of peritoneum, as in the previous case, was well down behind the symphysis, completely out of sight. It was therefore absolutely impossible in this case, as in the other, to approach the anterior wall of the bladder extraperitoneally. Moreover, it was impossible to sew the bladder to the edges of the abdominal wound in such a manner as to shut off, even partially, the peritoneal cavity. Gauze in abundance was therefore packed all about the bladder. In this case there had been no extravasation as the result of the injection. A longitudinal incision was made in the anterior and upper portion of the bladder, through which the boric acid solution escaped. Two stones were found in the bladder shaped like the two symmetrical halves of a lemon which had been cut transversely (Fig. 2.) The contiguous surfaces of these two stones were smooth, and made up, apparently, of concentric layers. I suppose that this was a case of spontaneous fracture of a single large egg-shaped stone. Both calculi were removed with some difficulty from a soft, easily-bleeding matrix. One fragment weighed 598 grains; the other 573½. The edges of the bladder were then sewed to the edges of the abdominal wound, with here and there a gauze strand to provide against peritoneal contamination. The interior of the bladder was packed with sterile gauze. At the end of four days the gauze was removed from the bladder, its place being taken by a catheter. A week later the catheter was removed from the abdominal wound and inserted through the urethra. In three weeks the catheter itself was removed from the urethra, the patient emptying his bladder freely. He was discharged well on July 2.

On October 10, 1895, Dr. Belt wrote as follows: "Mr. W. has been steadily at work as an upholsterer for two months. . . . He has

FIG. 1.—Large vesical calculus removed by intraperitoneal cystotomy.

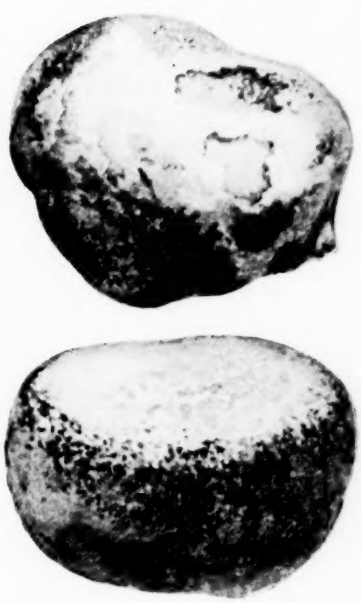

FIG. 2.—Upper and lower stones.

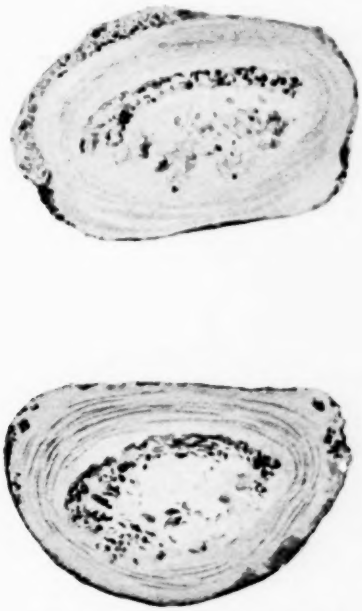

FIG. 3.—Sections of the two stones.

gained steadily in strength, and with the exception of a subacute cystitis is doing well."

In 1885, at the Northampton Insane Asylum, I removed by litholapaxy a stone weighing 1950 grains. The operation lasted an hour. In this case no difficulty was encountered in distending the bladder sufficiently. The evacuation of the fragments was rapid and satisfactory. A fatal result, however, followed in the course of a few days. The patient had been insane for many years and had never complained. There was, therefore, no means of telling the age of the stone.

In another case a colleague at the Massachusetts General Hospital crushed and removed by lateral lithotomy a stone fully as large as this one. The laceration of the bladder and of the peritoneum was excessive. The patient died in a few days of surgical kidney.

In reviewing these fatal cases it has been a question whether the suprapubic route would not have been preferable. A fatal result would have doubtless followed the suprapubic operation, for other elements of a most serious nature entered into the case; yet by the suprapubic route the calculus in both could have been removed more quickly and with less laceration. Moreover, by the method employed of intracystic gauze packing, immediate and perfect capillary drainage would have been insured.

If further experience in intraperitoneal cystotomy shows, as I believe it will, that the dangers of peritonitis can be successfully avoided, it seems probable that the method used in the cases above reported will have an application considerably wider than it has thus far had; for in many cases of bladder tumor, of enlarged prostate, and of stone, the opening in the prevesical space will be found insufficient for satisfactory manipulations. The range of the method, however, will be limited to those cases in which the perineal or urethral routes are either impracticable or injudicious, and in which the ordinary suprapubic extraperitoneal method is not feasible.

CHRONIC PERIVESICAL INFLAMMATION.[1]

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ON April 15, 1895, I was asked to see Lewis C., fifty-eight years of age, an attendant in one of the wards of the Colored Hospital, who had been suffering for a long time with symptoms of severe vesical inflammation. The man had been a patient of the hospital at different times since 1885, and had remained permanently since October, 1892, acting as nurse about the ward. He had complained at various times of attacks of lumbar pain together with increased frequency of urination and vesical tenesmus.

These attacks occurred at longer or shorter intervals and some were much more severe than others. The patient, however, would never submit to an examination of his bladder, and had gone on suffering a great deal until his condition became unbearable.

The attack for which he finally sought surgical aid began several weeks before my examination, and was very much more severe than any he had previously experienced. He was confined to bed, suffering intensely with severe pain in the region of the bladder and passing at very frequent intervals and with great difficulty small quantities of bloody urine.

On examination, he appeared much emaciated and weak from his prolonged suffering and loss of sleep. His face was drawn and anxious, his pulse feeble, and his general condition bad. His radial arteries and the peripheral arteries generally were hard and inelastic.

He had concealed his condition for a long time, until finally, overcome by his sufferings, he begged the surgeons to do something

[1] Read before the New York Surgical Society, November, 1895.

for his relief. He complained of great pain above the pubes and in the perineum, and said that his urine was passed in a very small and sometimes interrupted stream, and at very frequent intervals, day and night. He said he had passed gravel on several occasions.

An examination of his urine showed a large amount of pus and mucus, also many hyaline and granular casts and red blood-cells.

It was extremely foul smelling, generally bloody, and of low specific gravity.

There was extreme tenderness above the pubes, and the abdominal wall in this region seemed hard, dense, and unyielding. No distinct tumor could be made out before the anæsthetic was given on account of the great sensitiveness to pressure. The patient said he had noticed the hardness of the abdominal wall for a long time, but declared it had never been so tender before this attack. Ether having been administered, the urethra and bladder were carefully explored.

Several strictures were found in the anterior urethra and at the bulbo-membranous junction, but these permitted readily the passage of a Thompson searcher, which at once detected a stone in the bladder. An examination of the abdominal wall above the pubes, in the region where there was such great tenderness, revealed a wide area of induration. This induration extended half-way up to the umbilicus in the middle line and laterally running parallel with Poupart's ligament, reached nearly to the anterior superior iliac spines, forming a hard plaque or tumor, which occupied the hypogastric and extended into both iliac regions. The bladder was washed out with boric acid solution, and an attempt was made to distend it with the fluid preparatory to making the suprapubic incision. Its capacity was found to be barely two ounces, however, and any excess of that amount was forced out along-side of the catheter in the urethra.

A median incision was made above the pubes directly through the middle of the indurated area before described.

As soon as the skin incision was completed the knife passed into a dense mass of fibrous tissue. The sheaths of the recti muscles were nearly one-half inch in thickness. The linea alba was represented by a rather broad, dense mass of fibrous tissue, which spread out laterally into the thickened sheaths of the recti muscles, and beyond this into the aponeurosis of the external obliques. The usual landmarks were completely obliterated, and after cutting through a considerable thickness of this fibrous mass the bladder was opened without being first recognized, as its anterior wall was apparently incorporated with

the tissue described. With the finger in the bladder one could appreciate how intimately its wall was blended with the fibrous tissue which filled the prevesical space and extended out through the *linea alba* into the muscle sheaths beyond. The cavity of the bladder was small, its mucous membrane was soft and sloughy, and its contents very foul smelling. A soft phosphatic calculus weighing about one-half ounce was extracted. A stream of hot boric acid solution washed away some stinking sloughs, and the washing was continued until the return flow was fairly clear. The urethral strictures were then divided and a normal urethral calibre restored. The bladder was packed with iodoform gauze around a large tube, and drainage by siphonage arranged for. The patient was put to bed in fairly good condition, and the next day said he was free from his old pain and more comfortable than he had been for many months.

Suprapubic drainage was maintained, and the character of the urine improved very much under frequent bladder washings.

The wound in the abdominal wall granulated slowly, and the tenderness diminished steadily. As it became evident, after repeated attempts, that the capacity of the bladder could not be increased by hydrostatic pressure on account of the very extensive pericystitis, permanent suprapubic drainage was kept up, and the patient remained quite comfortable. On May 5, about three weeks after the operation, there was a slight uræmic attack with partial suppression, which yielded to internal medication.

After this attack, although the patient remained free from pain, he began to slowly lose ground. His bladder continued to drain well and was washed out daily, but the contents began to smell very badly, and this continued getting worse until May 28, when he died, exhausted, about six weeks after the operation.

Autopsy.—At the autopsy a most extensive pericystitis was demonstrated, which seemed to involve the perivesical tissues generally, but more especially the connective tissue of the prevesical space of Retzius.

The bladder was adherent posteriorly to the rectum, laterally to the sides of the pelvis, and anteriorly with the anterior abdominal wall and pubes. The space of Retzius was obliterated, being filled with a mass of fibrous tissue, which was continuous with the anterior vesical wall behind, and in front extended out through the linea alba into the sheaths of the recti muscles and laterally for a considerable distance into the aponeurosis of the external oblique muscles, form-

ing an extensive fibrous tumor, which occupied the hypogastric and a portion of the right and left iliac regions. The walls of the bladder were thick, but soft and friable, and the mucous membrane was gangrenous. The prostate was enlarged and the specimen was dissected out with great difficulty. Both ureters were dilated, and the pelves of both kidneys contained pus. The cortices were thinned, and small foci of pus were scattered through both. The lesions were more advanced in the left kidney. The aorta and the arteries generally were stiff and calcareous.

It seems remarkable that a patient with such extensive lesions should have survived so long. The operation gave him the first real relief he had had for years, although he had been driven to submit to it only by the intensity and persistence of his suffering.

Much has been written on the subject of perivesical inflammation, but until the appearance of an article by Noel Hallé,[1] in 1892, the only form well studied had been the acute or phlegmonous variety.

Hallé, in an elaborate paper on the pathology of pericystitis, brings together a study of all the cases examined by him post-mortem, in 1891, from the wards of the Hospital Necker. After alluding to the diverse forms under which the disease presents itself, he calls attention to the less known variety of chronic pericystitis of which he has observed several forms:

(1) A sclerous inflammation of the perivesical tissues with few or no recognizable symptoms during life.

(2) A form in which there is an encysted focus of pus near the bladder, which may or may not communicate with that viscus, and in which there may be but few clinical signs.

(3) A variety secondary to a pelvic peritonitis, and leading to adhesions between the bladder and neighboring organs, in which a true perivesical tumor develops, and in which a fistulous communication is sometimes established.

In most of these cases the diagnosis was difficult, clinical observation proving that the symptoms are often ill-defined, the hypogastric pain vague, and the appearance of a well-defined

[1] Annales des Maladies des Organes Génito-Urinaires, November and December, 1892.

tumor finally leading the clinician out of his embarrassment. Occasionally even very extensive lesions were recognized only at the autopsy table.

The obscurity of these cases and their difficulty led Hallé to study them from a pathological stand-point, in order to group, compare, and combine isolated facts for the purpose of drawing some definite conclusions as to their relation to clinical signs and the indications for treatment.

He defines pericystitis as an inflammation of the perivesical cellular tissue, consecutive either to a cystitis or to a phlegmasia of the pelvic organs. He divides his cases of chronic perivesical inflammation into two great groups, the true and the false. The former, the more important, embraces those cases in which the bladder is the starting-point of the lesion. The latter, those secondary to inflammation of the other organs within the pelvis.

He divides chronic pericystitis of the true variety into two classes, the simple and the specific. Under the former head he classifies the sclerous or adipo-sclerous form and the suppurative. Under the head of specific, the tubercular and the neoplastic. The false variety he divides into the simple, which may be adhesive or suppurative, and the neoplastic, which may be adhesive or fistulous. Guyon early differentiated symptomatic from idiopathic pericystitis, and Bouilly, in 1880, going a step further, differentiated acute from chronic pericystitis, and divided the acute cases into those which were spontaneous or idiopathic and those which were secondary to trauma or extension of an inflammation from some neighboring viscus in the pelvis. He cites forty-three cases, of which twenty-seven are classified as idiopathic and sixteen as symptomatic or secondary.

Englisch,[1] in 1891, tabulated and reported twenty-three cases of idiopathic pericystitis which he had been able to find in the literature of the subject, and to this number he adds ten cases which he had himself observed. All other forms of pericystitis he groups under three heads,—viz., as (1) traumatic; (2) metastatic; (3) consecutive.

He remarks that the diagnosis between the idiopathic and

[1] Wiener medicinische Wochenschrift, October 17 to November 14, 1891.

consecutive form is often very difficult. It will be seen that he has narrowed down considerably the number of idiopathic cases, previously reported, by applying the closest scrutiny and rejecting those cases which he believed to belong in another class. As to the symptoms of idiopathic pericystitis, Englisch finds that in most of the cases the patient complained first of symptoms of gastro-intestinal disturbance, though in a few cases the appearance of a tumor above the pubes was the first indication of the trouble. At first there is generally rather marked constipation, with colicky pains and perhaps vomiting. Diarrhœa more or less persistent may follow, together with loss of appetite and a sufficient degree of prostration to confine the patient to bed. In a few days the pain, which up to this time may be the only localized symptom and which may be a dull or sharper pain in the prevesical region, becomes more severe and more sharply localized. Fever becomes more marked, and a tumor, which is generally symmetrical, and resembles a full bladder, appears above the pubes. The diagnosis may be made by passing a catheter and finding the bladder undistended and on the previous history. The tumor is generally V-shaped with the base upward. The urine may be normal, or there may be, in long-standing cases, a cystitis. The inflammation ends either by resolution or by suppuration, in the latter way more frequently. The prognosis he regards as fairly good in that out of the thirty-three cases there were only four deaths, and in these the abscess ruptured into the peritoneal cavity. Fourteen subsided without operative interference and twelve opened spontaneously, two into the bladder, two into the rectum, and the four already mentioned into the peritoneum.

Edouard Martin,[1] of Geneva, in 1893, reported a case of abscess of the space of Retzius in a child of sixteen months, the youngest case previously reported being one by Bouilly in a six-year-old female. In twenty-seven idiopathic cases reported by the latter writer only four were in females.

Martin, in reviewing the subject, finds the affection known

[1] Annales des Maladies des Organes Génito-Urinaires, January, 1893.

as idiopathic pericystitis more frequent in males and in young people. He divides the stages of the disease into two periods.

(1) The period of digestive and vesical disturbances, which may last for several days ; and

(2) The period four to ten days after, characterized by the appearance of a tumor above the pubes.

My case would seem to belong to that form of chronic pericystitis, which is designated by Hallé as the sclerous, and to belong to the true type of the disease in that it was apparently secondary to a chronic cystitis. It seems to me quite a remarkable case both with respect to the extent of the lesion and the clinical history. I have been unable to find a report of any such extensive lesion in any of Hallé's autopsies.

Fuller[1] in a short paper on the subject of " clinical symptoms due to pericystitis," gives the results of his own observations and treatment in a number of cases in which the lesions of perivesical inflammation were of moderate extent.

In all of his cases the cystitis was very troublesome, and treatment directed to the relief of this resulted generally in much improved condition of the patient, as regards pain, although the distensibility of the bladder was never regained in any of them, and they continued to have frequency of urination.

In the case reported by me it was proven impossible to increase the capacity of the bladder by distending it with fluid. This must be the condition in any case of extensive perivesical inflammation of the sclerous type, where the bladder is rendered undistensible by reason of its incorporation with the surrounding fibrous mass.

In cases in which the perivesical involvement has reached any considerable degree of development, the practice of endeavoring to distend the bladder by means of hydrostatic pressure in order to increase its capacity would seem to me to promise very little. In these cases suprapubic drainage is the final resort, and one which will give to these patients a considerable degree of comfort and relief from pain.

[1] Medical Record, April 13, 1895.

INJURIES TO NERVES IN FRACTURES: REPORT OF TWO OPERATIVE CASES IN FRACTURES OF THE HUMERUS AND CLAVICLE.[1]

By GWILYM G. DAVIS, M.D., M.R.C.S.,

OF PHILADELPHIA,

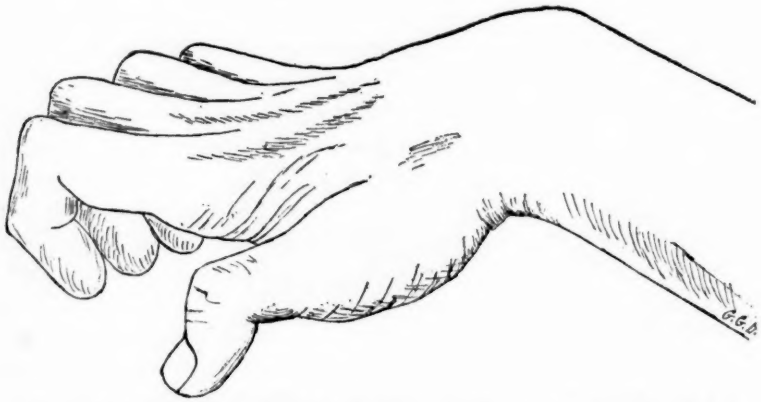
SURGEON TO THE GERMAN AND ST. JOSEPH'S HOSPITALS; ASSISTANT SURGEON, ORTHOPÆDIC HOSPITAL.

CASE I.—A boy, aged five years, was brought to the nervous clinic of the Orthopædic Hospital, suffering from contraction of the muscles of the right hand following a fracture of the lower end of the humerus. He was referred by Dr. Sinkler to the surgical clinic, and the following history was obtained: Six weeks previously he had broken his arm at the elbow, and on the removal of the splints the following condition was found. The forearm was flexed on the arm at an obtuse angle, and all the fingers were likewise flexed. Movement at the elbow-joint was impaired, as was also rotation of the radius. As the boy sat he supported the injured member with the arm of the opposite side. The wrist-joint was freely movable, but when an attempt was made to extend the hand the fingers were brought into extreme flexion. With the fingers extended the hand was flexed firmly on the forearm. There was a scar on the forearm, said to have been caused by a tin splint; it was, however, extremely superficial, not being attached to the deep fascia. The child was pale and somewhat strumous-looking, but otherwise appeared well.

Pain was not complained of, but the exact degree of sensation present could not be determined on account of the contradictory replies of the child. Massage and electricity were ordered for the patient by Dr. Goodman, under whose care he was, and the flexor carpi ulnaris and one or two of the more tense common flexor tendons cut. Some improvement followed and the patient left the hospital,

[1] Read before the Surgical Section of the Philadelphia College of Physicians, October 11, 1895.

but returned later and was placed under my charge. The condition then, five and a half months after the accident, was as follows: The movement at the elbow was good, pronation and supination limited, and apparent shortening of the flexor tendons. When the fingers were extended the hand was flexed tightly on the forearm, making about a right angle with it. When the hand was extended to about forty-five degrees, the fingers became contracted, and on attempting to farther extend the hand the fingers became still more strongly flexed at the phalangeal joints, though they did not become flexed at the metacarpo-phalangeal joints, but remained either level with the back of the hand or slightly above it. (See figure.) The thumb was not so markedly affected as were the fingers. The scar on the forearm below the elbow was too superficial to seriously involve any of the



Contraction of flexor muscles following fracture of humerus at the elbow-joint.

nerves or muscles, and was insufficient to account for the contractions present.

On examining the elbow, evidences of the fracture could be found in a bony prominence just above the joint extending from the tendon of the biceps inward. The contraction of the flexors of the fingers pointed unmistakably to an implication of the median nerve, and that of the flexor carpi ulnaris showed that the ulnar also was somewhat involved. As the muscles supplied by the median nerve were the most affected, and as the prominence of bone near the middle of the bend of the elbow was quite pronounced, it was decided to investigate this locality first, operating on the ulnar, if necessary, later. An incision to the inner side of the biceps tendon

was made, and it with the brachial artery displaced outwardly. The median nerve was exposed and found running along-side of a fragment of bone about three-quarters of an inch long and a half an inch in width, firmly fixed to the anterior surface of the humerus. This fragment was drilled away by an electrical drill and the median nerve allowed to resume its normal position from which it had been pushed by the fragment. The wound was closed by the subcutaneous suture and healing occurred by primary union.

For the week following the operation improvement was rapid, the movements of the fingers being much increased. Then for a while little change was noticed and massage was ordered, and improvement again became more noticeable until, when the child left the hospital after a few weeks, he had begun to use the hand, pronation and supination was much improved, the fingers and hand could be extended considerably more than before the operation, and while the cure was not yet complete, he was very much improved and a steady betterment of the condition was going on.

A curious fact in the case was that when the hand was flexed on the forearm and the fingers clinched, the child could move the fist to and fro. The thumb was quite free in its movements and certainly less affected than the fingers. With the hand firmly flexed the fingers could be flexed and extended freely, although there was some loss of power. There appeared to be no absolute paralysis of any of the muscles, and while the position of the hand resembled that seen in wrist-drop, and might cause one to suspect implication of the musculo-spiral nerve, still, the perfectly free movements at the wrist showed that this was not the case. Attempts at forcibly straightening the fingers provoked spasm of the flexor muscles, but after the operation by steady traction they could be stretched almost their full length.

The patient was so strumous that I deemed it best not to operate again and expose the ulnar nerve, particularly as his condition was steadily improving.

CASE II.—A man, aged twenty-three years. He was a miner, and while at work was crushed between a coal-car and the walls of the mine.

He was treated by his physician, who told him he had sustained a fracture of the right clavicle, two ribs, and scapula. At that time he had no pain, but the right arm was paralyzed.

Ten days later pains suddenly began at the seat of fracture of the clavicle and gradually passed down the arm, leaving the seat of

fracture; finally, the pain was only felt from the elbow to the fingers. It was of a sharp lancinating character and still persisted on admission to the hospital about eight weeks after the accident. Motion and sensation continued absent for four weeks after the reception of the injury, but then gradually returned. Motion was present only to a very slight degree in the fingers, and the whole extremity was stiffened, while the skin had a glossy appearance. On examining the clavicle it was found to be fractured at the junction of its outer and middle thirds. The inner fragment was drawn upward and the outer fragment was drawn downward and inward. The two ends were joined by a fibrous band, were movable,—that is, could be bent at the seat of fracture,—and there was a shortening of at least a half an inch.

In view of the fact of the extreme disability present and the lack of union and deformity at the seat of fracture, it was decided to elevate the depressed outer end of the clavicle and fix the parts in proper position. This would not only relieve the nerves of any pressure from the depressed bone, but would likewise relieve them of any which might be caused by inward pressure due to the overlapping of the fragments.

An incision was made parallel to the clavicle and the ends exposed. They were found to be one below and behind the other and united by a fibrous band. The line of fracture ran from above downward and inward.

The fibrous band of union was cut away and the ends of the bones freshened, and a spur of projecting bone left at the under side of the outer fragment. The lower fragment was then raised and carefully adjusted to the upper one and strongly bound to it by a silver wire one-sixteenth of an inch in diameter. This served to keep the fragments in firm apposition. The wound was then closed without drainage. The twisted wire was allowed to project and the arm placed in a plaster-of-Paris Dessault dressing.

Primary union occurred, and on the third day the pain in the arm was much relieved. By the second week the motion in the fingers was considerably increased, then motion in the wrist appeared, and the hand began to lose its glossy appearance. In four weeks the movements continued to improve and extended to the forearm. In seven weeks the wire was removed and the bones found firmly united without pus; before the eighth week he was discharged practically cured, with no pain and good motion in the hand and arm.

These are two cases illustrating the disabilities resulting from injuries to nerves at the time of fracture and their subsequent irritation due to displaced fragments, which disabilities, in the case in which splints were used, that of the elbow, were only recognized at the time of their removal.

One hears of interference with the function of nerves in fractures by callus, and some, had they seen the first case, would have been inclined so to regard it; but I feel convinced that impairment of function from that cause is much less frequent than generally supposed. My experience has been that it is far more commonly due to direct injury of or pressure upon the nerves by a displaced fragment.

It is only some time after the reception of an injury that the various symptoms produced subside, and it is by their persistence after repair of the bone has occurred that nerve lesions are discovered. When splints are removed and active movements attempted, then it is that one recognizes the contractions and paralyses and altered sensations due to injury of the nerves. Naturally, it is often supposed that the callus, which by this time is well formed, has included a nerve and disabled it. That this does occur sometimes there is no doubt, but more usually it will be found that the nerve has either been injured directly by the fracture at the time of the accident or else stretched and displaced by the edge of a displaced bony fragment. It is the latter which is most capable of being relieved by operative measures, and, while the tendency of the former is towards recovery, it is extremely slow in taking place.

The cause of the sudden onset of pain in the second case at the tenth day can only be conjectured, but it may possibly have been due to some movement of the patient disturbing the parts in the region of the injury, which disturbance was rendered possible by the fact of the continuity of the shoulder girdle being interrupted by the fracture of the clavicle. Both cases show the liability of injury at the time of accident being the cause of nerve lesions, and that neither were due to the inclusion or pressure of the nerves by callus.

The advisability of operating in such cases cannot, I think,

be questioned, and it seems to me there is much greater hesitancy in surgeons to operate than the condition of the parts require. It is certainly better to operate in such cases of disability arising in cases of fracture as soon as we recognize their serious character rather than wait until the condition becomes a chronic one, from which recovery is so much more slow and doubtful and, in some few cases, even impossible.

REPORT OF TWO SUCCESSFUL HIP-JOINT AMPUTATIONS, THE SECOND OF WHICH WAS PERFORMED BY A NEW METHOD.

By F. TILDEN BROWN, M.D.,

OF NEW YORK.

CASE I.—*Small Round-Cell Sarcoma of the Left Biceps Femoris. —Amputation at the hip through a Furneaux Jordan incision. Recovery.*

W. J. B., aged twenty-two years, United States, printer, was admitted to the Presbyterian Hospital December 4, 1894. When ten years old fell on stairs, injuring his left knee, the outer part of which was subsequently tender when struck, but not until four years later was a slight swelling noticed on the outer and posterior aspect of the joint. This continued to increase very gradually in size until three months ago, when the growth became rapid.

Examination shows a tumor on the outer and posterior aspect of the knee, not involving the joint, five inches long by four and three-quarters wide; it is somewhat lobulated, seems fluctuating, but not pulsatile. It prevents full extension of the knee. It is painless. Aspiration yields only bloody fluid. For diagnostic purposes, on December 10, an incision was made; the tumor on its surface showed infiltrated subcutaneous fat, pinkish in color. Bloody fluid mixed with masses of grayish semi-gelatinous material, to the amount of a pint, was evacuated. The walls of the cavity bled freely, and their friability prevented the use of a ligature. The cavity was curetted and packed tightly with sterilized gauze.

Pathologist's report showed the tumor to be a small round-cell sarcoma. For the succeeding five days the patient felt the effects of the operation, his temperature reaching 103° F.

December 18. Operation; ether. Patient's pelvis was brought to the end of the table, a low sand-bag was placed under the left buttock. Esmarch's bandage was not used through fear of disseminating sarcomatous elements, but the limb was held nearly perpen-

dicular for a few minutes before piercing the thigh with new $\frac{3}{16}$-inch mattrass needles, and applying above them the rubber tubing, after the adaptation of Wyeth. Just as the tubing was secured the outer pin began to bend and the tubing settled upon the trochanter major. It was necessary to remove the tubing, reinforce the bent pin by a fresh one, traversing the same puncture along its side, and reapply the tubing.

Standing between the thighs, both of which were supported by assistants, a seven-inch vertical incision was begun as high above the great trochanter as the encroachment of the tubing upon the region would permit. Through this longitudinal opening as complete as possible a separation of all the muscular attachments surrounding the joint was made, and the capsule divided on its outer and anterior surface. At the extremity of the longitudinal a nearly circular incision was made through the skin and a cuff of two inches laid back, when the external groups of muscles were divided to the bone, a blunt dissection stripped them from the shaft of the femur, and the inner group of muscles containing the vessels was divided last. Nothing now remained but to incise the capsular ligament more completely, and by my assistants' skilful manipulation of the leg and knee the head of the femur was rotated outward and the round ligament severed.

The femoral artery was ligated with silk, the other vessels with catgut. The sciatic nerve was cut back. A few deep retention sutures were placed. The wound was closed without drainage by interrupted silkworm-gut sutures, supplemented by a continuous suture of fine black silk. Iodoform gauze, cotton, and firm bandaging completed the dressing.

The operation proper occupied twenty-five minutes, and the patient left the table in good condition, without stimulation.

For a few days some constitutional reaction and elevation of temperature occurred, but these symptoms were not so marked as those following the preliminary operation.

December 27, nine days later, the first dressing was made. Primary union throughout. Interrupted sutures removed.

January 1, patient sat up. January 2, second dressing, all sutures removed. January 9, third dressing. January 16, photograph taken (Figs. 1 and 2). January 17, discharged.

The pathologico-anatomical report stated round-cell sarcoma, wholly confined to the outer or short head of the biceps flexor cruris, which had been much distended by the disease.

FIG. 1.—Amputation at the hip-joint through a Furneaux Jordan incision.

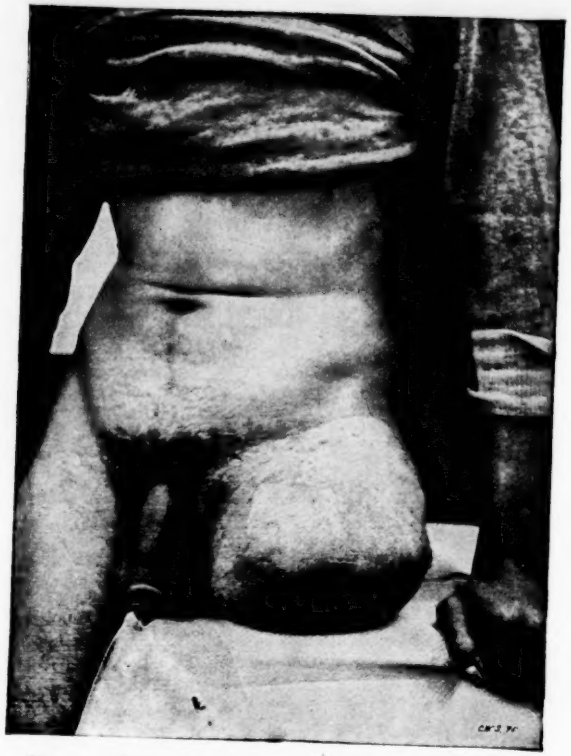


FIG. 2.—Stump of hip-joint amputation at the end of four weeks after operation.

The hæmostatic effect of the rubber tubing, supported by transfixion needles, was all that could be desired, the proximal face of the wound being relatively dry. But an objection to the method was noticed in that the skin and muscles about the joint were made so tense and hard by the compression of the tubing that the region was much more inaccessible to instruments and fingers than would have been the case if this constriction had not existed. And even after disarticulation the margin of the cotyloid cavity was difficult to trim up for the same reason.

Apparently recognizing this fault, McCurdy uses only the inner pin for figure-of-eight elastic loop, and Lanphear practises a higher point of insertion for the outer pin, one which Dr. Wyeth, in a recent article,[1] now proposes to adopt, so that the rubber tubing will be held "in the notch just below the anterior superior spine of the ilium."

Having a strong and expert assistant to manipulate the leg as indicated, it appears to me advantageous not to saw the femur just before disarticulation, but to save time and gain power by retaining the leverage of the entire limb.

CASE II.—*Tubercular Osteo-Arthritis of the Hip; Amputation at the Hip-Joint by a New Method through an Antero-External Incision.*—T. D., aged 27 years, female, married, United States, was admitted to the Presbyterian Hospital, June 21, 1895, suffering from tuberculosis of the hip-joint of the third degree.

About two years previous she began to have pain in the left hip and knee when walking. She took to bed in October, 1893, and remained so confined for five months. On getting up, patient was much bent; she could not stand straight or walk; the left leg was contracted,—only the toes could touch the ground; the left knee was increased in size. An abscess near the trochanter became a sinus, discharging intermittingly for months. Later two similar sinuses formed above and behind the knee. She has lost much weight in past two years.

On admission, temperature 102.4° F., pulse 138, respiration 36; urine negative.

Physical examination revealed signs of some pleurisy at the base

[1] How to Amputate. New York Medical Journal, November 16, 1895.

of right lung. Subsequent examination showed tubercle-bacilli in the scanty sputum.

The left leg was three-quarters of an inch shorter than the right; thigh and calf each three-quarters of an inch less in circumference than the right; foot slightly inverted. Palpation about the hip showed a boggy fulness and elicited pain. There was a discharging sinus behind and below the great trochanter leading towards, but not into, the joint. Two discharging sinuses opened above the popliteal space, being superficial and leading upward. The slightest movement of her leg caused great pain, ascribed mostly to the knee.

For three weeks subsequent to admission her condition remained unchanged. She had a daily rise of temperature to 103° F. or more. She suffered great pain with every slight movement. Efforts to immobilize the limb were futile. She begged for any operative interference. Dr. Briddon saw the patient and endorsed my proposal to excise if the conditions justified it; otherwise, to amputate at once.

July 11, 1895. An incision was begun half an inch below the anterior superior spinous process of the ileum, and prolonged downward in the intermuscular septum between the sartorius and rectus on the inner side and tensor vaginæ femoris and glutei on the outer. This afforded, with scarcely any bleeding, excellent access to the capsular ligament and the tissues immediately surrounding it, where a cavity containing considerable tubercular *débris* was rapidly cleared out with a Barker flushing gouge, which delivered sterilized salt solution at 110° F. under a good gravity pressure. On opening into the capsule, advanced tubercular disease was found; the parts here were similarly cleansed with the flushing curette and examined.

The conditions of disease presented by the joint and surrounding muscles, combined with the extreme debility of the patient and her age, were not considered favorable for excision.

Preparation for amputation consisted in a brief massage of the leg and thigh while held perpendicularly. At the same time one jaw of a specially made clamp was passed through the existing incision, guided by the finger, under the sartorius and under the femoral vessels close to Poupart's ligament, the other jaw being outside the wound and bearing upon the cutaneous surface overlying the vessels. As the clamp was moderately tightened and the limb lowered, pulsation of the femoral below the clamp could not be felt by the finger in the wound. The handle of the clamp rested upon the abdomen, where it lay parallel with the flare of the pelvic brim.

The application of the clamp to the vessels was a simpler matter than I had anticipated. It required but a moment or two to force the finger under the sartorius and under the sheath of the vessels as they lay upon the psoas, and through this short space, along the upper side of the finger, was slipped one blade of the clamp, the tip of which was sheathed with rubber tubing, a possibly unnecessary precaution against injury to the vessels.

It was presumed that the anterior crural nerve would lie just to the outer side of the clamp compression and in the same fenestrum of the instrument as that surrounding the sartorius.

The patient's pelvis was now brought to the end of the table. The left leg was supported by an assistant, while the right thigh was flexed upon the pelvis and secured to the abdomen and table.

The existing incision was extended along the outer border of the rectus downward to the bone, and through this deep incision the remaining attachments to the joint and femur were mainly stripped off. A circular skin-cuff was cut and turned back. The femoral clamp was tightened one point before severing the muscles with a circular incision to the bone. Some of the small branches of the sciatic system required the application of pressure forceps, but the femoral vessels and their branches were absolutely dry on the proximal side.

It remained only to turn downward and backward the divided muscular cuff, raise through it the thigh, and sever the posterior part of the capsular ligament, when the head of the bone was turned outward by my assistant and the round ligament cut. The femoral artery was ligated with silk, all outer vessels with catgut. Gradual loosening of the femoral clamp by stages permitted an excellent opportunity of seizing the bleeding points in regular order of their importance, and the clamp afforded a simple method of quickly opening or closing the blood-current in the main channel.

The rather extensive muscular portions concerned in the abscesses and sinuses had been cut away with scissors before ligation of the vessels. The diseased portion of the acetabulum was curetted, and the wound-flaps united by interrupted silkworm-gut, then more accurately adjusted with a continuous suture of fine black silk. Drainage by iodoform gauze was provided for at the uppermost part of the wound, and through the large sinus formerly behind the trochanter. The expediency of this drainage, I think, was questionable.

As all preparation had been made to utilize saline venous infusion

at some time during the operation,[1] one and a half litres were now thrown into the median cephalic vein by Dr. Hartwell while the wound was being sutured. The beneficial effect of this infusion was at once manifest, and the patient left the table with a fuller and slower pulse than she had had since admission to the hospital.

On the night of the operation her temperature was 103.6° F., pulse 136. From that time until noon of the day following a gradual decline of temperature and pulse occurred, reaching: temperature 96.6° F., pulse 100, respiration 24. The same afternoon the temperature was 99.5° F. For six days her temperature was not above 101° F.; then pulmonary symptoms became gradually more noticeable, and before being discharged she again, on a few occasions, had pyrexia reaching 103° F.

July 14. Four days after operation first dressing. Union was excellent along the whole extent of sutures. Over the femoral vessels there was no mark or discoloration to suggest that any clamp pressure had been sustained at that point. The drainage gauze was removed and a smaller strip of the same kind introduced. The ready access to the line of sutures, occupying, as it did, the entire anterior face of the stump, made it a comfortable one to inspect for both patient and surgeon. Subsequently, dressings were made at four-day intervals until she was discharged to go into the country, on August 18, five weeks after operation. (Fig. 3.)

Although still a victim of pulmonary tuberculosis, her happiness in being relieved of the painful hip-affection justified the risk she had assumed.

As soon as I consented to operate at all upon this patient, I began to anticipate that the incision for excision would probably reveal a state of affairs requiring amputation, and with this in mind I felt the need of some hæmostatic device which would permit one operation to merge into another without the loss of valuable time. As it was possible that a deep-seated psoas abscess existed about the joint without invading it, an immediate hip amputation without exploration would be illegitimate. An exploratory incision, then, must first be made, and the best one for this particular case was that of Hueter and Parker,[2] between

[1] McBurney, ANNALS OF SURGERY, August, 1894.

[2] Clinical Society Transactions, Vol. XIII.

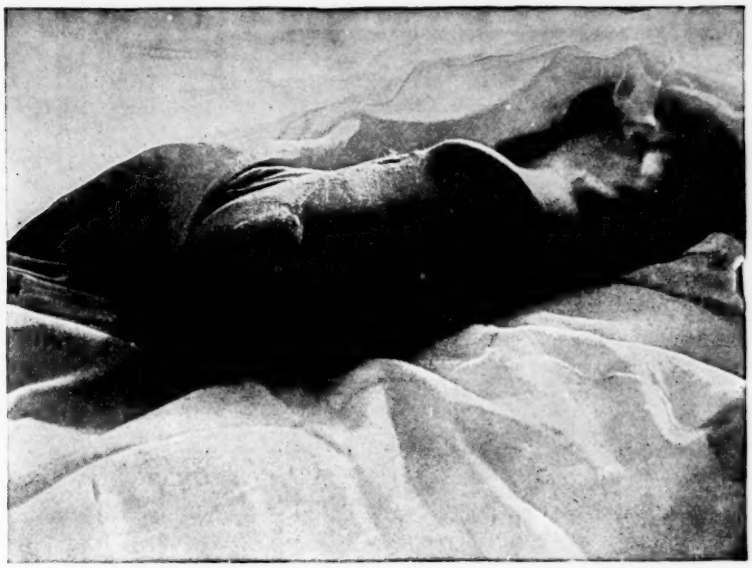


FIG. 3.—Amputation at the hip-joint through an antero-external incision. The transverse dark line is a cutaneous fold caused by the bandaging.

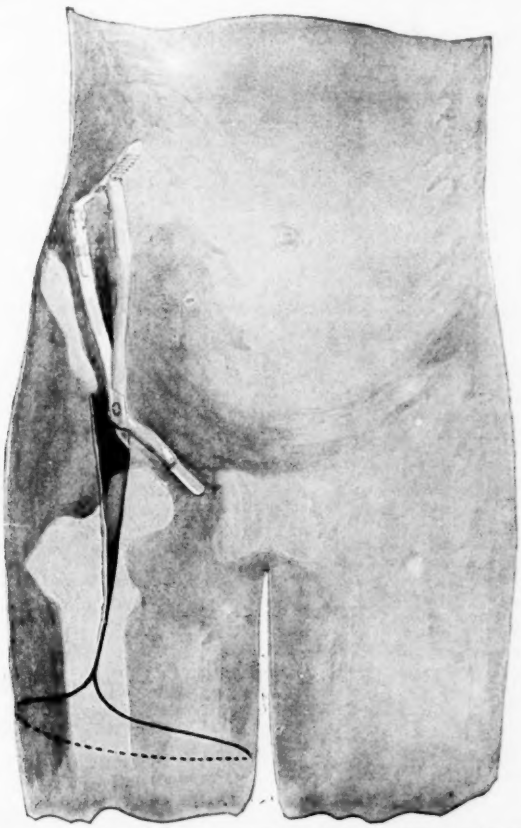


FIG. 4.—To show the antero-external incision with its relation to the upper extremity of the femur and to the femoral clamp.

the muscles having origin at the anterior superior spinous process. When through this incision the conditions requiring amputation were revealed, what form of tourniquet or arterial compression should be utilized before proceeding? In answering this query, I could think of none which would not take considerable time to apply or else be illy adapted to the particular incision already made to expose the joint. The only ready resort appeared to be digital compression exerted by an assistant standing at the patient's side and facing the operator, who should slip his index-finger under the sartorius and the femoral vessels, while his thumb rested upon the cutaneous surface. This idea was the origin of the clamp, the steel jaws of which could be relied upon not to tire, and it was believed that if the finger could effect an easy access to a point under the vessels below Poupart's ligament that the clamp could as easily follow the finger's lead.

From my satisfactory experience with this method of amputation at the hip-joint, although only in a single case, I feel justified in advocating it, and desire to formulate its claim for merit on the following points:

(1) The incision is one which permits the best exposure of the joint through tissues which contain no vessels or nerves of any importance, and the same incision serves for the easy adjustment of a clamp upon the femoral vessels before advancing to the critical stages of the operation.

(2) The angled shape of the clamp is such that while it securely compresses only the femoral artery and vein between their sheath and the overlying skin, it serves at the same time as an inward retractor for the sartorius muscle, and the instrument is wholly out of the operative field during all its stages. Esmarch's bandage may be applied up to the ischium, and yet space remains for the incision through which the clamp can be inserted.

(3) The continuation of the incision along the outer border of the rectus and down to the bone is one containing a minority of the arterial branches of the sciatic, and furnishes a wound which is directly before the operator, and through which, after

the circular severance of the muscles, the femur can be vertically raised to expose the posterior attachments about the joint and the corresponding part of the capsular ligament.

(4) Because of the antero-external position of the incision, both the open wound and its final suture are most accessible to the operator. The same advantage applies to subsequent inspection and dressing of the stump, as well as the remote chance of urinary or fæcal contamination of the line of suture.

5) The belief that this operation, including the period of anæsthesia, can be performed in a shorter time than any of those where the danger from hæmorrhage is as thoroughly guarded against.

The incision originated nearly simultaneously by Hueter and Parker, in 1878, has had its manifest advantages admirably expounded by Barker,[1] as the ideal one for hip-joint excision, but I have not seen it mentioned as a selective one for hip-joint amputation, and this probably only because it has not hitherto had associated with it any simple hæmostatic adaptation. Certainly, all the methods of amputation which depend upon elastic compression or a tourniquet, which encroaches upon the region just below the anterior superior iliac spine, would necessarily preclude its use.

If I had occasion to do another hip-joint amputation, I would wish again to utilize the incision here recommended; and if I were deprived of the services of the clamp, I would employ digital compression of the femoral vessels immediately below Poupart's ligament, the forefinger being passed through the upper angle of the incision and under the sartorius muscle to beneath the common sheath of the artery and vein.

I see no reason why an incision commencing at the same place, but there deepened only sufficiently to pass under the sartorius, should not then be continued in length and depth along the outer border of the rectus for the performance of a trochanteric or high amputation of the thigh. The method would have the advantages of celerity and excellent retraction of the soft parts for sawing the bone.

[1] British Medical Journal, January 19, 1889.

As a retrospect to this method of hip-joint amputation, I can foresee no possible criticism of the incision advocated; while to the use of the clamp I can anticipate only two objections:

(1) That those branches of the internal iliac, the gluteal, and sciatic, supplying muscles on the posterior part of the thigh are exempt from control until cut; and

(2) That some injury to the femoral vessels may follow their compression by the clamp.

In the majority of cases I believe the former objection can be disregarded, for it is exceptional to be obliged to make so short a posterior flap as to invade the bodies of the gluteal muscles, where the vessels of this group are of some size. As to their only moderate branches encountered by the above incision, catching them when cut with artery forceps is quite a sufficient precaution. The same holds good of the sciatic artery and its branches. In the exceptional cases just alluded to the accurate hæmostatic method of McBurney [1] is unquestionably the best,—namely, that of digital compression of the common iliac through an abdominal incision. But in other cases the complete retraction of the muscular flaps permitted by the femoral clamp makes application of the artery forceps to these small posterior vessels particularly easy.

The second objection can be dismissed when we realize how slight a degree of direct compression is necessary to occlude even so large a vessel as the common femoral, for the blood-tension is not greater than the pressure of a column of water six feet high.

In order to test the sensitiveness of the living tissues to a degree of compression necessary to prevent any leakage from a column of water of twice this pressure, I placed a rubber tube coming from a fountain syringe along the surface of the little finger, and included finger and tube in the clamp for half an hour without any marked discomfort.

The occlusion was so complete and the discomfort so slight that I believe this clamp method would be an improvement on the practice once much in vogue for the cure of femoral and

[1] ANNALS OF SURGERY, August, 1894.

popliteal aneurism,—namely, instrumental or digital compression of the vessels against the pubic bone. The facts that by the clamp the crural nerve could wholly escape compression and the vein suffer only a slight diminution of its calibre appeal in its favor. The wound made for the clamp insertion is an immediate disadvantage, but by aseptic precaution it should amount to nothing more than does this same practice, which, in place of ligation, is not infrequently resorted to now for forty-eight hours or more.

The original clamp made for me by Messrs. Stohlmann and Pfarre is the exact counterpart of this, except that in the latter I have had the serrated spring lock made reversible to fit either handle, consequently the instrument is equally convenient for both right and left hips. The projection of the spring catch should point upward from the abdomen.

The jaws of the clamp (Fig. 5) are at an angle of 130 degrees with the handles. The points of the jaws are a scant three-quarters of an inch long. The fenestrum (for straddling the sartorius) is a little more than one and a half inches in length. The points of the jaws are smooth and flat on their opposing surfaces, and just parallel when one-tenth of an inch apart.

The only advantage in capping these points, when in use, with rubber tubing is that the entire instrument may be steadied by a firmer hold upon moist tissues with a minimum amount of pressure.

Fig. 4 shows the relationship of the antero-external intermuscular incision to the hip-joint and to the femoral clamp.

Fig. 6 shows the relationship of the clamp's fenestrum to the sartorius muscle and the jaws of the instrument to the femoral vessels close to Poupart's ligament. In the illustration will be also noted the inward retraction of the sartorius, as is shown by the muscle itself, as well as by the reduced size of Scarpa's triangle. By this retraction the advantageous exposure of the insertions of the rectus muscle and of the capsular ligament is apparent.

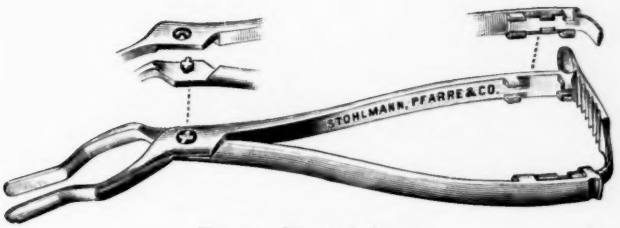


FIG. 5.—Femoral clamp.

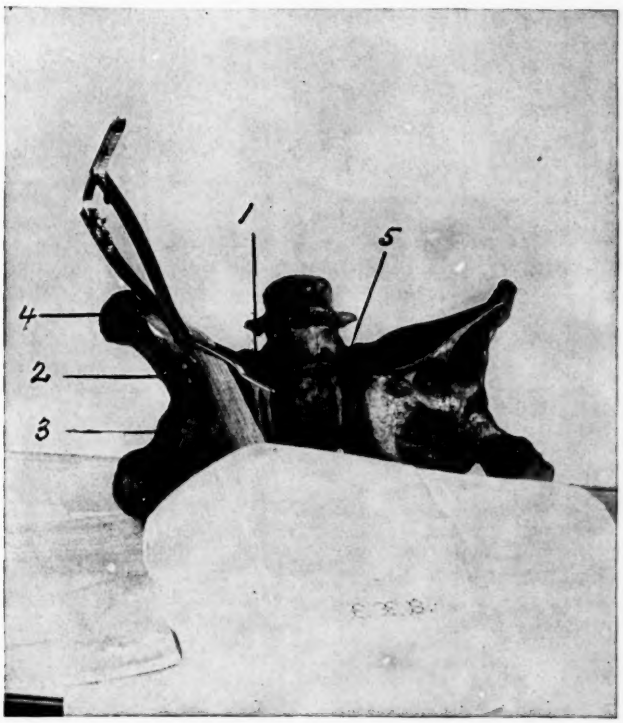


FIG. 6.—Showing application of clamp to the femoral vessels.

1. Poupart's ligament, femoral vessels below it grasped by the clamp.
2. Sartorius straddled and retracted by the clamp.
3. Hip-joint well exposed by inward retraction of sartorius.
4. Origin of sartorius at the anterior superior spinous process.
5. Symphysis.

A CONTRIBUTION TO THE THEORY OF CEREBRAL CONCUSSION.[1]

By S. P. KRAMER, M.D.,

OF CINCINNATI,

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IN the course of a research on gunshot wounds of the cerebrum, published in the Philosophical Transactions of the Royal Society, 1894, in which it was my privilege to be associated with Professor Victor Horsley, it occasionally happened that through faulty ammunition or great thickness of the skull the bullet did not penetrate the cranium. The phenomena produced in such animals must, from the nature of the case, be ascribed to cerebral concussion. These experiments seemed to me worthy of being further worked out.

General and Historical Considerations.

As a result of a direct or indirect blow to the head an individual sinks to the ground unconscious. His voluntary muscles and often the sphincters are completely relaxed; he is indifferent to all sensory impressions. These symptoms may rapidly disappear and leave no trace, or the unconsciousness may become deeper, the individual become comatose. He is perfectly passive; his reflexes are abolished; the respiration is shallow and slow in rhythm, perhaps irregular; the pulse is irregular, weak, easily compressible, and perhaps slow.

All of these symptoms speak for a diffuse disturbance in the brain,—a disturbance of the cortical as well as of the medullary centres. Post-mortem examination of fatal cases may reveal

[1] From the Pathological Laboratory of the Cincinnati College of Medicine and Surgery.

lesions, and very often none are found. We may find a localized blood-clot, a superficial and localized bruising of the cortex, but these localized lesions cannot account for the diffuse symptoms which we have just enumerated. In some cases, though not in all, multiple punctate hæmorrhages are found throughout the substance of the brain. In a number of other cases nothing is found except a congestion of the veins of the pia mater. There is no constant lesion which would account for this diffuse disturbance on the part of the nervous system.

The old idea that the symptoms of concussion are produced by the transmission of the blow to the brain in the form of oscillations which disturb the relations of the molecules of the brain must be abandoned. Alquié and Fischer found that if glass vessels filled with gelatin having the consistency of brain-substance were subjected to blows, no change in the relations of the particles could be produced.

Duret[1] describes concussion as "choc cephalo-rhachidien." As the result of his experiment he believes that the force of the blow to the head is transmitted chiefly by means of the cerebro-spinal fluid; that the extraventricular fluid is forced through the foramen of Magendie into the fourth ventricle and then into the central canal of the cord, and through the aqueduct of Sylvius into the third ventricle, and then through the foramina of Munroe into the lateral ventricles. That a dilating pressure is hereby exerted on the walls of the ventricles and produces tears and ecchymoses, more especially in the floor of the fourth ventricle.

The objections to this theory are:

(1) It does not explain the injuries to the rest of the brain, as is evidenced by the cortical paralysis or coma.

(2) Injury to the fourth ventricle will not produce coma. (Tilanus.)[2]

(3) Cerebral concussion can be produced in animals after draining off the cerebro-spinal fluid through an opening in the atlanto-occipital membrane. (Tilanus.)[3]

[1] Gazette Médicale, 1877.
[2] Dissertation, Amsterdam, 1883.
[3] Loc. cit.

Besides this, we know that we are not justified in supposing that the force is only conducted by the cerebro-spinal fluid. From the experiments of Ferrare and Kocher,[1] and from physical considerations, we know that pressure in the intracranial cavity is transmitted in all directions, to all intents and purposes as in a fluid, so that the intraventricular pressure could never be greater than the extraventricular tension.

Koch and Filehne[2] produced the symptoms of concussion in animals without causing visible anatomical lesions in the brain or skull. Their experiments were based on the following physiological principles: The function of peripheral nerves is destroyed by irritants or stimuli of a sufficient or maximum intensity; these stimuli in minimum intensity produce no effect, or when of medium intensity stimulate to the production of the specific energy of the nerve, such as muscular contraction, sensation, pain, etc.

The continued application of stimuli of medium intensity, especially mechanical irritants, will eventually produce the same cessation of function as that produced by the single maximum blow. Acting on these principles, instead of causing the concussion by a single blow, as it occurs usually clinically, they sought to do it by subjecting the animals to blows of moderate intensity, but by continued action to produce the same cessation of cerebral function. The skulls of dogs were hammered with a percussion hammer, weighing from 250 to 500 grammes, until unconsciousness and the other symptoms of cerebral concussions were present. That the authors produced the symptoms of concussion in this manner there can be no doubt. But the hypothesis upon which they base their experiments presupposes that the condition is brought about by purely nervous influences. Their experiments give us no information as to the mechanics of the process. They demonstrate that symptoms similar to those found in concussion may be produced by a mechanical over-stimulation of the brain. The process may be an altogether different one in concussion as we see it clinically. For instance, the function of nerve-cells may also be interfered with by cutting off the nutrient supply.

[1] Spalanzani Modena, 1882, Deutsche Zeitschrift für Chirurgie, Vol. xxxv, p. 448.
[2] Archiv für klinische Chirurgie, Vol. xvii, p. 190.

A much more rational explanation of the diffuse disturbance of cerebral function as we see it in cerebral concussion was given by Stromeyer. He held that the blow depressed the skull and produced a momentary increase of intercranial pressure which compressed the blood-vessels, and therefore cut off the supply of blood.

Method of Investigation.

Anæsthetic.—The animals (dogs) were anæsthetized with ether administered by a funnel connected with a tracheal tube. They were kept insensible throughout the experiment, so as to avoid all possible errors from sensory impressions, pain, etc.

Record of Circulation.—The blood-pressure and cardiac contractions were recorded by means of a mercurial manometer connected with the left femoral artery.

Record of Respiration.—The respiratory movements were recorded by means of a Paul Bert exploring tambour attached to a strap which encircled the lower part of the thorax. This tambour was connected by means of a rubber tube with a Marey tambour whose writing lever recorded the movements of expansion and contraction of the chest as a whole.

Intracranial Tension.—In some of the experiments a record of the changes in the intracranial tension were obtained in the following way: A metal tube five millimetres in diameter was screwed air-tight into a trephine hole in the right parietal bone, the dura being open. This tube was filled with physiological salt solution and connected by means of a rubber tube with a Marey writing tambour. The descending stroke represents increase of tension.

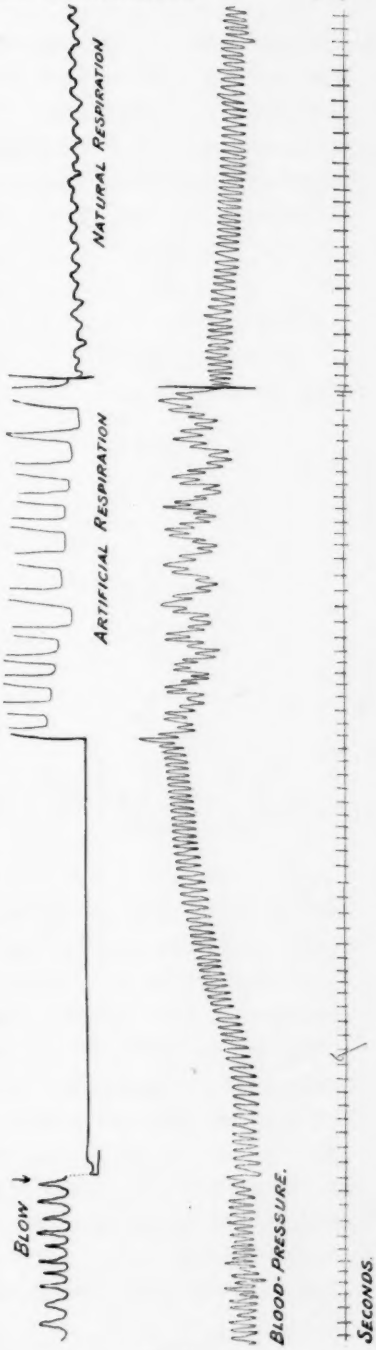
Record of the Moment of Application of the Blow.—In some cases the force employed was that of a 22-calibre short bullet fired from a pistol. The weight of the bullet was thirty-two grains, the velocity 450 feet per second. The record was obtained by the marking of an electric signal which was connected with the battery by means of a fine wire which passed across the muzzle of the pistol. The bullet on leaving the pistol broke the circuit and caused the signal to mark upon the paper. A brass plate, 0.9 millimetre thick, was fastened to the left parietal bone to prevent penetration. In other cases the concussion was pro-

duced by a falling weight which terminated in a round rod fifteen millimetres in diameter. To this was attached one wire of an electric circuit, the other wire being attached to a piece of copper foil laid upon the left parietal bone. At the moment when the weight struck the skull, an electric circuit was closed and the closure marked by means of an electric signal writing on smoked paper.

Record of Time.—The time was marked by means of a metronome beating seconds, which was placed in circuit with an electric signal, thus transmitting the rhythm to the kymograph. In all, fifteen experiments were made.

RESULTS OF INVESTIGATION.

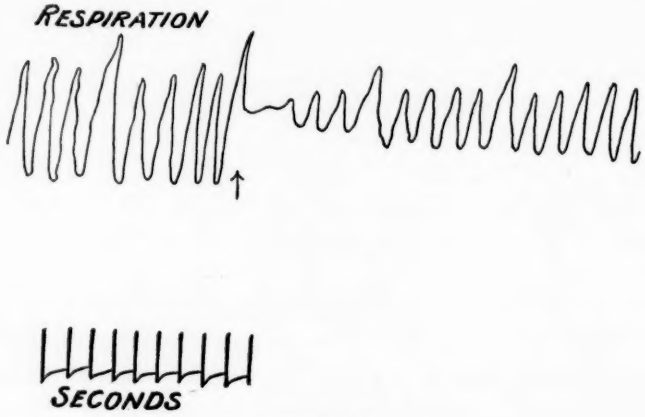
Respiratory Changes.—The changes produced in the respiratory movements are the most striking. They vary according to the concussing force employed. The maximum effect was obtained in those cases where the force was that of a 22-calibre bullet. Tracing I illustrates such an experiment. We have here cessation of respiration at the moment of shooting, the thorax remaining in the position of expiration. There was no spontaneous respiratory movement in this case for about forty-five seconds. Fifteen artificial respirations were made,



Tracing I.

when the natural respiration set in somewhat shallower than before, but eventually recovering its normal depth. This animal was subsequently killed by bleeding, and the brain and skull examined post mortem. The skull was found to be fractured and very slightly depressed for an area one-half inch in diameter in the left parietal region. There was some slight subdural hæmorrhage at this point; the veins of the pia mater were engorged; the ventricles and medulla normal. The base of the brain was free from hæmorrhage.

In such cases the cessation of respiration would undoubtedly (as I have seen) have become permanent, were it not for the



Tracing II.

artificial respiration. I believe that this is the cause of death in those cases where sudden death follows a blow to the head.

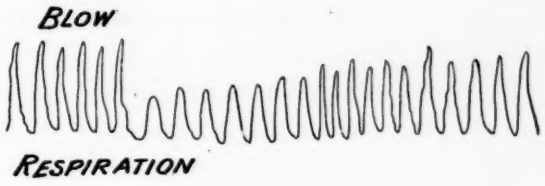
This may be regarded, then, as the maximum effect. Depending upon the force of the blow and the thickness of the skull, we have disturbances which, while they are of the same tendency, are not so pronounced.

Tracing II is taken from an experiment in which the blow was administered with a hammer weighing 240 grammes applied to the bared skull. Here we have a dropping out of about two respirations and then a resumption, at first very shallow, but soon recovering a fairly normal depth. Tracing III represents a similar experiment where there was no cessation, but an appreci-

able slowing of rhythm and shallowness of inspiration, followed by a rapid recovery. Post-mortem examination in both these cases showed an absolutely normal skull and brain. In all of these tracings the ascending stroke represents inspiration, the descending expiration. The tracings are all to be read from left to right. The immediate effect of the blow is in general one which has a paralyzing effect upon the respiratory centres in the medulla.

Changes in Circulation.

Blood-Pressure.—In the more severe concussions, as is represented by the experiment yielding Tracing I, the blow was immediately followed by a slight fall in blood-pressure. This did not exceed five millimetres, and was soon followed, in those cases where respiration ceased, by a notable rise due to asphyxia;



Tracing III.

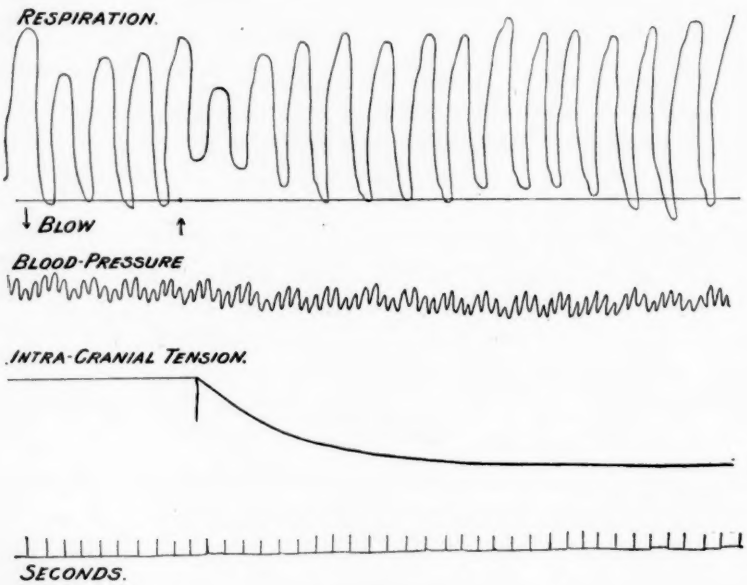
this rise disappeared with the institution of artificial respiration and the restoration of spontaneous breathing.

Rhythm.—In cases of pure concussion—that is, where we had no subsequent severe intracranial hæmorrhage—there was no appreciable change in the cardiac rhythm.

Force of the Heart.—In those experiments in which we had cessation of respiration, the force of the heart's action increased appreciably after the blow. This is the product of the asphyxia, since it disappears with the restoration of breathing.

Intracranial Tension.—The blow always produced a sudden increase in the intracranial tension. This is very well illustrated in Tracing IV. We see here that the writing lever of the tambour gives a marked descending stroke at the moment of incidence of the blow. This is followed by an almost instantaneous return, showing that the depressed skull rapidly resumed its former

position. The subsequent gradual increase of tension shown in the tracing was produced by the flow of blood into the tube connecting the cranial cavity with the tambour. This blood came from the cut vessels of the dura and bone, the force of the blow causing a capillary oozing from these surfaces, which before had ceased bleeding. The blow used here was that of a weight of 1385 grammes falling from a height of one metre. The skull in this case was not fractured.



Tracing IV.

Physical Considerations and Discussion of Results obtained in this Investigation.

We may regard the skull as an elastic capsule filled with soft solid and fluid contents. From the experiments of Felizét and Bruns, we know that the skull is elastic. A blow to the skull will therefore produce a momentary depression and return if there be no fracture. A depression of the skull means a corresponding diminution in the volume of the cranial cavity, and, unless its contents can be equally diminished, there results an increase of intra-

cranial tension. That this increase may be considerable, as the result of blows of moderate force, I was able to demonstrate in the following manner: All the openings in a dry skull were carefully plugged and made water-tight with wax and shellac, and the base of the skull embedded in a box of plaster of Paris. This box was then fastened to the table. In one parietal bone a trephine hole was made, and into this was screwed a steel tube. After carefully filling the skull with water, the inside of the skull was connected by means of the above tube with a lead tube leading to the registering manometer. A weight of 1460 grammes was now allowed to fall upon the skull from a distance of one metre. An increase of pressure of eighteen millimetres of mercury followed the blow, the skull being unbroken. The force of this blow is not in excess of that used in many cases of concussion, and in all probability the increase of tension would be greater in the living skull than in the dried specimen.

We may then regard it as proven that a blow to the head produces an increase of intracranial pressure. The force of the blow would then become a compressing one, and the lines of force would operate in all directions according to the principles of hydrodynamics. This conclusion is borne out by the phenomena observed in this research, since the changes in the respiration found are similar to those resulting from increase of intracranial pressure, as shown by the researches of Spencer and Horsley,[1] Hill,[2] and others.

It remains, then, to show how this increase of intracranial pressure would produce the symptoms of concussions. The explanations of Duret are not satisfactory for the reasons given above. Kocher[3] maintains that the blow, by being converted into a hydrodynamic force, acts as a crushing power, producing tears and hæmorrhages throughout the brain. In some cases these lesions are seen, in others he assumes them to be present, but not visible to the naked eye. He believes cerebral concussion to be a microscopic bruising of brain-substance involving a

[1] Philosophical Transactions, 1891.
[2] Journal of Physiology, LV, p. 52.
[3] Loc cit.

large portion of the brain, produced by the transmission of the force of the blow through the medium both of the brain-substance and cerebro-spinal fluid.

The assumption that the bruising of the brain is always present is to me not sufficient and not justifiable, more especially in the absence of sufficient histological investigation.

There are three ways in which the increase of intracranial tension might act: by compressing the brain-substance, by driving the cerebro-spinal fluid out of the cranial cavity into the circulatory apparatus, by compressing the blood-vessels.

The brain-substance itself is said to be incompressible. As a matter of fact it is not completely so, but its compressibility is so slight that it need not be taken into consideration. The removal of the cerebro-spinal fluid is an absorptive process, is therefore comparatively slow, and cannot materially compensate the sudden increase of intracranial tension. The blood is pumped into the brain under a certain pressure from behind and against a certain intracranial pressure in front. A sudden raising of this latter will necessarily prevent the proper amount of blood from going to the brain-substance. This means a diffuse anæmia of the brain. We know from the experiments of Kussmaul and Tenon that coma is caused by deficient nutrition of the cells of the cortex. The disturbances on the part of the medullary centres, which we have described, may also be produced by anæmia, so that the theory of anæmia produced by increase of intracranial tension seems to explain in the most rational manner the immediate symptoms of cerebral concussion. The subsequent symptoms depend upon the amount of damage done to the brain, the vessels, the amount of hæmorrhage, etc. The capillary hæmorrhages and bruising that are sometimes found may have been produced by the driving of the brain against the rigid skull, as would occur from the increased tension. They do not occur in all cases, and their presence is not necessary to account for the symptoms.

Conclusions.

A blow to the head produces a momentary increase of intracranial tension and consequent compression of the brain as a whole.

The effect of this compression would be to cause an interference with the blood-supply to the entire brain, and this is sufficient to account for the primary symptoms of cerebral concussion.

The so-called syncopic death after severe concussion is produced by a paralysis of the respiratory centres, the cardiac centres remaining intact. This fatal result may in many cases be prevented by the prompt institution of artificial respiration.

AN IMPROVED APPARATUS FOR DRAINAGE BY SIPHONAGE IN OPERATIONS ON THE BLADDER, CHEST, AND OTHER CAVITIES.

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LAST summer, at the British Medical Association meeting, Mr. Charles W. Cathcart, of Edinburgh, kindly showed me an apparatus for drainage by siphonage, which struck me as very simple and efficient. I have since tried it in three or four cases with so great advantage to the patient and comfort to myself that I desire to draw attention to it.

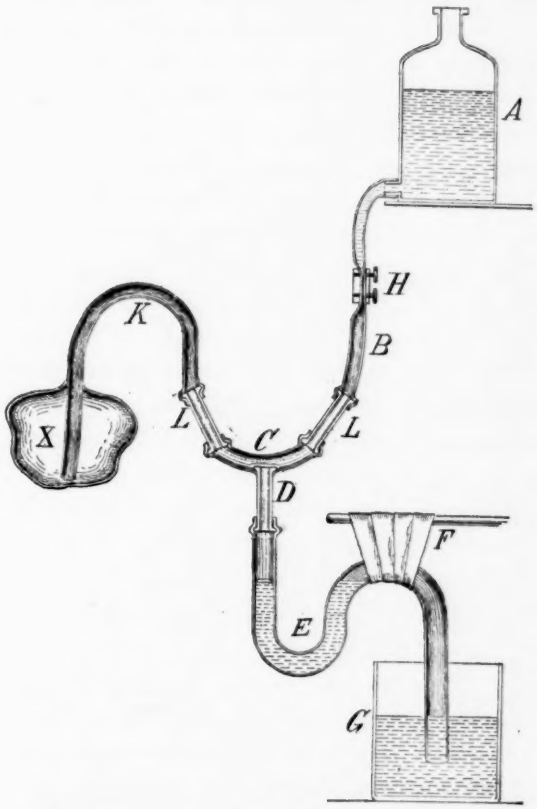
It has been published by Mr. Cathcart.[1] I have been able, however, partly as the result of necessity, to improve and simplify it in two or three particulars, which make it, I think, more easily available, while being equally efficient. The illustration shows the method as employed.

A is a reservoir and *B* a rubber tube for carrying the water off. The reservoir may be either, as represented in the drawing, one of the large glass bottles commonly employed for antiseptic solutions, with an opening near the bottom from which the tube *B* comes, or it may be a simple bucket of water; in which case the tube *B* is held in the bucket by means of a weight at its end. Care, of course, must be taken that it does not kink, as it passes over the rim of the bucket, by making it curve by binding the tube to a wire or otherwise.

C is a rubber tube four inches long. This also may be pre-

[1] British Medical Journal, October 19, 1895, p. 968.

vented from kinking in the middle by binding it to a curved wire, though, if the tubing is tolerably stout, this is not necessary. In the middle of the piece of tubing *C* a very small slit is cut, and into this slit is slipped a piece of glass tubing *D* three inches long with a flange on each end. The opening in the rubber tubing being very small makes the joint between *C* and *D* air-tight.



Keen's improved method of drainage by siphonage.

From *D* passes another rubber tube *E*, which conducts the water from *A* to a second bucket *G*, under the bed. This is looped up so as to form a trap, so to speak, by looping it up by a bit of bandage *F* to the bedstead or mattress in such a way that at the point *E* a distinct loop is formed, making a water-trap analogous to the water-trap of an ordinary water-closet.

H is a screw clamp by which the calibre of the tube *B* is reduced to such an extent that the water escapes from *A* but little more than drop by drop.

K is a rubber tube from the cavity *X* (bladder, chest, abscess, etc.) to be drained. *L*, *L* are two glass tubes similar to *D*.

By placing the reservoir *A* on a table along-side of the patient's bed, it is evident that the water will escape through the tubes *B*, *C*, *D*, and *E* into the waste-bucket under the bed. In doing so, however, it will accumulate in the loop at *E* until it fills the trap. As this every few minutes becomes over-full, it siphons rapidly over into the waste-bucket, and in doing so creates marked suction at every siphonage. This suction is the important point. Inasmuch as the clamp *H* reduces the calibre of the rubber tube *B* to a minimum, the suction cannot to any extent draw the water from the reservoir *A*, and hence it sucks through the rubber tube *K* any pus, urine, or other fluid from the cavity to be drained.

Of course the tube *K* must be secured to the dressing so that it will not become displaced from the cavity which we wish to drain. It is well also to put a safety-pin or bandage at one or two other points to prevent displacement.

The apparatus is much simpler in practice than it looks in the drawing, where its parts have to be explained somewhat in detail. It works continuously and with absolute certainty, keeping any cavity to be drained entirely free from liquid. All that is necessary when the apparatus is thus reduced to its simplest terms is two pails or reservoirs, rubber tubing, three small glass tubes, and the little screw clamp, which last can be, if need be, a simple clothes-pin, the jaws of which are kept separated by a bit of wood of suitable thickness.

The only changes I have made from the original by Mr. Cathcart are the substitution of the rubber and glass tubes *C* and *D*, and of the loop *E* for ⋎- and -shaped glass or metal tubes, which cannot always be obtained quickly.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, November 13, 1895.

The President, ROBERT ABBE, M.D., in the Chair.

SARCOMA OF SKULL TREATED SURGICALLY AND BY TOXINS.

DR. ABBE presented a child, eighteen months old, with a tumor over the right temporal region about the size of an orange, which was slightly larger when he first saw the patient. There was also slight exophthalmos and deformity of the orbit on the right side. The growth had first been noticed by the mother when the child was three months old. He supposed it was an osteo-sarcoma or chondroma, and attempted its removal by the chisel, but found that it extended quite as deep within the cranial cavity as it projected without. Recognizing, then, that it was inoperable, he began the use of mixed toxins of erysipelas, with the result that the tumor began to subside, and was now slightly smaller than it was when he attempted to remove it eleven months ago, and the child's general condition was much better. Professor E. K. Dunham had made microscopic examination of the tumor, and had pronounced it an endothelioma of the class of sarcoma, arising from the dura.

SEPARATION OF UPPER EPIPHYSIS OF HUMERUS; OPEN OPERATION.

DR. CHARLES MCBURNEY presented a boy, fifteen years of age, whom he had first seen in the previous June, five days after he had fallen in a gymnasium, striking upon his left shoulder.

The shoulder was then uniformly swollen and the skin red, the temperature was 101° F., and the pulse rapid. The head of the bone was in the glenoid cavity and separated from the shaft at the epiphy-

seal junction. Crepitus did not exist, for the shaft was displaced upward and forward in front of the epiphysis, and its rough end could be felt but a short distance beneath the skin. Ether was administered, but reduction could not be accomplished by traction and manipulation. He therefore made a vertical incision about three inches long over the prominent upper extremity of the shaft. The fracture was found to be exactly at the junction of epiphysis and shaft, and the shaft projected through nearly the entire thickness of the deltoid muscle. The periosteum had been split vertically, and it and the muscular fibres were so folded under the upper end of the shaft that reduction could not be made without incision. These soft parts being held aside with retractors, reduction was easily made and accurate apposition of the bone ends obtained. The slit in the periosteum was then closed with catgut, and the more superficial wound closed in the same way with drainage. Clean wound healing rapidly followed. The motion at the joint is now entirely restored, and one arm can be used quite as well as the other. No difference in the length of the two humeri exists, although the boy has grown much since the injury.

REPEATED OPERATIONS FOR APPENDICITIS.

DR. LUCIUS W. HOTCHKISS presented a boy, aged seven years, who had been admitted to the Manhattan Hospital, June 27, 1895, on the third day of an attack of acute appendicitis. At that time the temperature was 99.2° F., there was general abdominal tenderness, and a special point of tenderness on the right side. The case was left for twenty-four hours, and at the expiration of that time an oblique incision was made, through which a large abscess was evacuated, which extended down behind the cæcum into the pelvis. The lower end of the wound was packed with gauze, and, with the exception of a shutting off of a local collection of pus at the lower portion of the wound, which was opened subsequently, the patient did perfectly well, and was discharged August 13. The appendix was not found, for the abscess was a large one, the intestines about it were well walled off, and it was not deemed advisable to break down the adhesions in order to search for the appendix.

The patient was readmitted September 30, with a history of having again developed appendicitis three days before, exactly three months after the primary attack. The second attack was much more severe than the first, the general condition was worse, the abdominal

pain and tenderness were greater, the temperature was higher. The tumor was more to the left and higher. On the day of admission an incision was made over the tumor, considerably above and to the left of the former incision. The appendix came directly into view, and was found to have emerged from the posterior surface of the cæcum and passed upward and inward towards the umbilicus. It was gangrenous at the tip and perforated, and a large abscess had formed which was well walled off. The findings at the second operation showed, he thought, that the right course had been pursued at the first operation in not searching for the appendix, as it was at a distance in another direction. The first attack had been entirely recovered from before the development of the second.

Dr. McBurney endorsed the course pursued by Dr. Hotchkiss in this case, in not searching for the appendix at the first operation. There had been a great deal of discussion on the question whether it was ever justifiable to leave the appendix after opening the abdomen for appendicitis. He thought that those who insisted upon searching for it until they found it in all instances were likely some time to lose their patient. In his opinion each case would have to be judged by itself.

IDEAL CHOLECYSTOTOMY.

Dr. Willy Meyer, on presenting a case, said that the indication for performing ideal cholecystotomy was rather rare, and could present itself during the operation only. His patient was a man, thirty-five years of age, who had first presented himself last May, stating that about a year and a half before that date he had had for some five weeks continuous pain in the epigastric region. He had never vomited. Being under constant care, he slowly recovered. By September, 1894, he was able to again attend to his business. The following year he suffered from a feeling of pressure and pain in the pit of the stomach three or four hours after eating. He never vomited. He lost flesh.

When Dr. Meyer examined him he found all the signs of enlarged stomach. Careful examination of the contents of the stomach showed hydrochloric and lactic acid, affording no basis for a more exact diagnosis. The pain was in the epigastric region, not in the region of the gall-bladder. No tumor could be felt.

Exploratory incision was made May 17, 1895. The enlarged stomach was found, but it was not so easy to make out the pylorus. The liver was somewhat enlarged. The gall-bladder could neither be seen nor felt at first, but on pushing the finger underneath the liver it came in contact with a hard lump, which was taken for gall-stone. After a good deal of work in separating adhesions, he reached the gall-bladder, which was of hour-glass shape, and contained a like shaped stone. The stone was removed. As the gall-bladder could be of little use, he thought of extirpating it, but the adhesions were so firm that even with the use of the Paquelin cautery it would have involved too much hæmorrhage. On account of its deep situation underneath the liver, it also appeared impossible to unite it with the parietal peritoneum. The only operation feasible, therefore, was the ideal cholecystotomy. Catgut was used for suturing. The abdominal wound was not fully closed, allowing for drainage by a small piece of gauze. The question had come up during the operation whether to do gastro-enterostomy, but he succeeded in freeing the stomach and pylorus from their adhesions, and let the case rest as stated. Von Hacker had done gastro-enterostomy in a similar case. The patient made a good recovery, regained flesh, and was now able to digest all kinds of food perfectly.

REMOVAL OF BILIARY CALCULUS IMPACTED IN THE COMMON DUCT.

Dr. A. J. McCosh presented a woman, thirty-two years of age, who had been well until August, 1894, when she was seized with sudden pain in the region of the liver, accompanied by chill and followed by vomiting, and within a few hours jaundice developed. These symptoms continued two or three weeks, and then gradually disappeared, except the pain. Two or three weeks later she had another attack, and so on during the autumn and winter, being seized every few weeks with pain, vomiting, chill, and reappearance of jaundice. From August until the following March she was never free from pain, and during more than half of this period she was troubled with jaundice, chills, and vomiting.

She entered the Presbyterian Hospital last March, at which time an irregular hard mass was felt just under the right rectus muscle, about the size of a small hen's egg. On opening the abdomen the omentum, intestines, and bile-ducts were found agglutinated, and on separating them a stone was felt impacted in the common duct at

about three-quarters of an inch from its entrance into the duodenum. With some difficulty he got his finger under the duct, lifted it upward, made an incision about an inch long, and extracted the stone, which was about the size of a hickory-nut. This was followed by the exit of another stone and an ounce or two of bile. The incision in the duct was closed by two rows of interrupted catgut sutures, a strip of gauze was passed down along the line of sutures, and the rest of the abdominal wound was closed. The gauze was removed about the fifth day. There was no leakage, the patient made an uneventful recovery, had been free from pain and jaundice, and had gained seven pounds in weight since the operation. The wound is firmly closed, without sign of hernia.

In reply to a question, Dr. McCosh stated that the walls of the gall-bladder were about twice the thickness of ordinary blotting-paper.

Dr. Abbe added that in two or three cases he had found the walls thickened, as if the muscular layer had undergone development in the attempt of nature to extrude the gall-stone. In this state, incision and suture were not likely to be followed by leakage.

RESECTION OF JOINTS FOR TUBERCULOSIS.

Dr. Charles K. Briddon presented four patients whom he had subjected to joint resections for local tuberculosis. The hip-joint and the knee-joint, in one case each, and the elbow-joint, in two cases, were the parts affected. In three cases complete local healing, with great improvement in the general health, had followed. In one of the elbow cases there were still present discharging sinuses, but the local condition was constantly improving.

SARCOMA OF RADIUS; AMPUTATION OF FOREARM BY A NEW METHOD.

Dr. Charles McBurney presented a woman, thirty years of age, who had received a slight wrench of the left wrist-joint in January, 1895, which caused some pain. A few weeks later painful swelling of the joint occurred, which increased until she came under his observation in May. A considerable, nearly uniform, half fluctuating swelling of the left wrist-joint then existed, the appearances being those presented by tubercular disease of the joint. Operation was undertaken, but the first incisions revealed that the swelling was due to the presence of a soft vascular tumor, enclosed in a firm capsule,

and about the size of a hen's egg, originating in the head of the radius, which was destroyed by the disease to the extent of about one and a half inches. Microscopic examination showed that the tumor was a spindle-celled sarcoma containing numerous giant cells.

As the ulna was entirely free from disease, and as the tumor had a firm capsule and belonged to the radius alone, he amputated by a new method. A vertical incision was made from the elbow-joint downward over the radius to the middle of the forearm, and then carried circularly about the forearm. The flaps of muscle and skin being dissected up, the whole radius was excised and the ulna sawn through just below the insertion of the pronator radii teres. The biceps' tendon had been carefully dissected away from the radius, and this tendon was now strongly sewn with catgut to the base of the coronoid process of the ulna, so that flexion of the forearm might be strengthened. As a result the patient has now a good half forearm and her power of flexion is excellent. The biceps seems to perform its function well. The disease has been sufficiently radically removed for such a case, and the limb is now a much more useful one than if amputation at the elbow had been done.

DR. FRED. KAMMERER said that in a case of sarcoma of the lower end of the radius under his care during the past summer he had excised the entire radius and amputated very near the elbow-joint, leaving a part of the ulna in the flap. He was tempted to do what Dr. McBurney had so well accomplished in his case, securing action of the biceps after transplanting the tendon of this muscle. In his own case he thought it would be wiser to excise a thin layer of bone at the insertion of the tendon to the radius, leaving it in connection with the tendon and chiselling for it a corresponding groove at the site of implantation in the ulna, for it seemed to him doubtful whether the tendon, cut off near its insertion, could be sewed to any part of the ulna with sufficient probability of primary union. He asked Dr. McBurney whether he had sutured the tendon to the periosteum of the ulna. The result in Dr. McBurney's case showed there must have been firm union to the bone. In his own case he had not been able to see the final result.

DR. MCBURNEY replied that about half a dozen of the sutures were applied to the periosteum. With two of the sutures he picked up some of the fibres of the brachialis anticus, the tendon passing farther down the ulna and being attached to the periosteum. The attachments were not very powerful, but were sufficient to keep the

parts in contact until union had formed. He had no doubt but what there was union with the bone.

DR. STIMSON spoke of the absence of statistical support of the rather widely held opinion that in amputating for malignant disease of bone it was necessary to amputate at least as high as the next proximal joint. The opinion sometimes led to the sacrifice of portions of limbs which, if the opinion is not well founded, might otherwise be preserved and be of great service to the patient.

He thought it might even be possible and proper in some cases to remove only the affected bone and preserve the distal portion of the limb, as the hand, in cases somewhat like Dr. McBurney's. Within the year he had attempted to do this in a case of sarcoma of the humerus, but the implication of the deeper soft parts was such that he abandoned the attempt and disarticulated at the shoulder.

NEPHRECTOMY FOR DISPLACED KIDNEY AND HYDRONEPHROSIS.

DR. MCBURNEY presented a boy, fourteen years old, who was admitted to the Roosevelt Hospital on September 8, 1894. During the preceding year he had had a number of attacks (twelve or more) of nausea, prostration, and hypogastric pain. Each attack lasted three or four days, during which time an intra-abdominal hypogastric tumor was present. When the tumor disappeared all symptoms were relieved at once. On admission to the hospital no tumor existed, but slight tenderness on pressure over the lower abdomen was noted.

On September 11, a tumor, firm and round, about three inches in diameter, occupying the median line just below the umbilicus, was noted. It was dull on percussion. The next day Dr. Hartley operated, making a long median incision and uncovering a post-peritoneal tumor which rose to the anterior abdominal wall. The tumor was clearly made out to be cystic, but its exact origin could not at that time be made out, and as the surrounding wall was exceedingly vascular, it was incised, and the edges of the incision were sewed to the edges of the abdominal wound. A pint of clear yellow fluid was evacuated. No communication between the interior of the cyst and any viscus could be demonstrated. The fluid was subsequently shown to be urine. The patient made a good recovery, the opening remaining, however, and continuously discharged urine.

Attempts to show the connection between the cyst and the blad-

der were made with methyl-blue, but without success. To determine the exact nature of the cyst and to examine the surrounding parts, Dr. McBurney made a free incision in the left linea semilunaris into the peritoneal cavity. Through this incision the fingers could determine the outline of a kidney lying posterior to the cyst-wall and intimately connected with it. In the same manner the absence of the left kidney from its normal position was ascertained. The conclusion was that he had to deal with a displaced cystic kidney, and that the urinary fistula and cyst could be cured only by nephrectomy. He did not think it wise to do this operation at that time, and so closed the lateral wound, which healed primarily.

On June 5, 1895, operation was begun with a view of removing the cyst-wall and kidney together. The cyst was first washed out and then packed with gauze. The fistulous opening was closed by suture and the belly-wall resterilized. A median incision from the umbilicus downward and encircling the fistulous opening was made and the peritoneal cavity opened. Numerous firm adhesions were torn or tied. After some dissection the renal artery and vein were found entering the tumor at its posterior edge behind the cyst. These were tied and cut. The cyst could now be clearly made out to be the dilated pelvis of the kidney, the mass of which hung deeply into the pelvis of the patient. Crossing in *front* of the kidney itself, between it and the anterior abdominal wall, was the short ureter. Doubtless this position of the ureter accounted for its occasional obstruction and for the distention of the pelvis of the kidney. Division, after ligature, of the ureter followed, and it was then not difficult to remove the kidney, cyst, and fistulous tract in one mass. The abdominal wound was partly closed by suture and partly packed and drained.

No interruption to recovery followed, and the patient has remained perfectly well. Excluding a congenital condition, as symptoms did not appear until the eleventh year, the condition existing in this boy can only be accounted for on the supposition that the left kidney was displaced downward in such a manner that its lower end passed *behind* the ureter. When operated upon, the body of the kidney lay across and within the pelvis of the patient. The renal vessels entered the hilum just opposite the last lumbar vertebra, and the ureter passed from the distended pelvis of the kidney across the anterior face of it to the bladder.

DR. KAMMERER said that from the nature of the attacks he should assume Dr. McBurney's case to have been one of intermittent

hydronephrosis. It certainly seemed to prove that a movable kidney was most frequently the primary cause of retention in the pelvis, and that valve-formation at the junction of the ureter and pelvis of the kidney and twisting of the ureter or kinking were probably secondary to displacement of the organ. He had shown at a previous meeting of the Society a specimen of hydronephrotic kidney, which he had obtained from a young woman of twenty, who had also begun to suffer from such attacks as Dr. McBurney described, in her sixteenth year. They had increased in frequency, and were accompanied, when the patient was seen by the speaker, by the formation of a tumor the size of a child's head, which was situated mainly in the false pelvis, but could be discovered by bimanual palpation from the lumbar region also. It gradually disappeared after the attacks. The tumor was removed by a lumbar incision, and was found to be the kidney, pelvis and kidney proper being distended into one large sac. There was very little kidney substance left.

PLASTIC OPERATIONS ON THE HANDS.

DR. ABBE presented three young women illustrating the result of plastic work for injuries to the hand produced by the mangle machine and burning in the process of ironing. Opportunity was afforded here for a variety of plastic work. In the first case the dorsum of the hand had been burnt and all the fingers were drawn backward. Much improvement had been effected by excising the scar and Thiersch grafting, but there was yet room for more. In the second case the palm of the fingers and hand had been extensively burned; the fingers were drawn down and the palm tightly closed. The fingers had been straightened and Thiersch grafts placed in the palm, but the tips could yet be improved by a flap from the thigh, affording a softer palmar surface. The third case was one of burn of the palm, the fingers being drawn together in one cone, the palm filled with a hard callus. By separating the parts and dissecting down to the bone, he was able to apply Thiersch skin-grafts, get an open hand, and a thumb with considerable grasping power. It was interesting to note that the Thiersch skin-graft did not undergo keloid contraction, like old burn-scars. In some cases in which the tendon had been destroyed, its function had been partly taken up by fibrous tissue.

EPITHELIOMA OF LOWER LIP; NO RELAPSE AFTER TEN YEARS.

DR. ABBE also presented a man, over fifty years of age, upon whom he had operated for epithelioma, involving more than the breadth of the entire lower lip, eleven years before. A large wedge-shaped piece was removed, splitting the cheek out to the ear, and by means of plastic operations a good lip was left. An enlarged and softened gland was removed from beneath the chin at the same time. There had been no recurrence. Photographs of the original condition were exhibited, showing a large exuberant cancer of the entire lip.

CANCER OF THE APPENDIX VERMIFORMIS.

DR. L. A. STIMSON presented a specimen of cancer of the vermiform appendix. He removed it from a lady, forty-four years of age, who ten years ago had had a very severe attack of appendicitis, an attack which had laid her up several weeks. She spent the following ten years in health, so far as he knew, and then about two months ago had an attack which was diagnosticated as appendicitis, and which, after running a relatively mild course, terminated in two weeks in recovery. Two days later there was recurrence of sharp, severe type, which led him to operate, and he removed the specimen presented,—the appendix in a state of cancerous degeneration. It is four inches long and nearly an inch thick, and the greatly thickened mucosa projects in the form of a ring into the lumen of the cæcum.

PECULIAR FORMS OF THE APPENDIX.

DR. STIMSON also presented some specimens representing peculiar forms of the appendix. At an early stage of development in the fœtus there is a cæcum, but no appendix; this cæcum, by arrest of development, becomes the appendix, and a new cæcum is formed by pouching of the wall of the colon near the root of the appendix. In the two specimens shown the appendix springs from the lower end of the cæcum, constituting persistence of the early fœtal form. Both were large, fully six inches long, and in one the cæcum narrowed uniformly into a funnel to terminate in a dilated appendix; in the other the cæcum had its usual cylindrical form. Twice within a fortnight he had encountered the appendix of the latter form during operations for pelvic disease in women, the appendix springing

from the extreme lower end of the cæcum, but not of so large size as in the specimens presented, which had been taken from the cadaver. The cases contradicted the statement in books on anatomy, that the cæcum was always an entirely extraperitoneal organ.

TERATOMA OF COCCYGEAL REGION.

DR. STIMSON also presented a specimen of bone, resembling somewhat a jaw, and containing teeth, which formed part of a tumor he had recently removed by operation from a child five years of age. The tumor was situated between the coccyx and anus and had existed since birth, but had increased notably of late; it was about three inches in diameter and rose nearly as much above the normal level of the region. He made a longitudinal incision over its most prominent part, and encountered the sac of a dermoid cyst containing semi-solid white, cheesy substance and the bone already referred to, which had puzzled him during the preliminary examination, as he was unable to determine whether it was a part of the tumor or the distorted, movable coccyx. The dissection was a somewhat tedious one, it being necessary to go up between the rectum and coccyx, but it was completed without wounding the gut.

FORMALIN CATGUT.

DR. B. F. CURTIS made some remarks on formalin catgut. He said Dr. Cunningham had introduced the use of formalin for hardening catgut. He had been using it in his own practice for some time, and the results had been satisfactory.

The method of preparation was very simple, and was founded on the fact that formalin had the power of hardening gelatinous substances. Photographers used it for hardening the gelatin on their plates, after which an intense heat could be applied without disorganizing the gelatin. Dr. Cunningham found that the same method was applicable to catgut, for on hardening this in formalin it could afterwards be sterilized by boiling in water without destroying its utility. There were some difficulties met with, however, for different samples of catgut differed in their reaction to formalin, and it was not possible to tell by the appearance of the specimen of catgut whether it would give a good or a bad result when hardened in formalin. Some specimens lost as much as 50 per cent. of their strength.

There were two solutions, called A and B. Solution A consisted of formalin, one part; water, one part; 90-per-cent. alcohol, one

part. Soak one and a half to two and a half hours, according to the fineness and tenderness of the catgut. Solution B: formalin, one part; water, six parts. Soak twelve to fifteen hours. The latter, he thought, was preferable. After soaking in the solution, the catgut was boiled in water ten or fifteen minutes, and then was ready for use. The usual loss of strength was not much greater than what occurred by the common method of disinfecting catgut by boiling it in alcohol. By the latter method about one-fourth the strength was lost. Of course this necessitated the use of a heavier catgut. In using formalin, one did not depend alone upon boiling for sterilization, for formalin itself was antiseptic, killing anthrax bacilli and also the spores in five hours where only a 5-per-cent. solution was used.

The catgut should be wound loosely on spools, as it shortened greatly in boiling. He preferred to keep it in a solution of formalin 1 to 100, boiling it again when about to be used. By using the formalin solution the surgeon became independent of the instrument-maker or druggist, for he could prepare his own catgut, as it came at wholesale.

DR. W. W. VAN ARSDALE said he had had some experience with formalin catgut, and it had always given perfect aseptic results. He had found, however, by testing with a machine specially contrived, that the tensile strength of catgut prepared in formalin was reduced one-half, and for that reason he had given it up.

Stated Meeting, November 27, 1895.

ANDREW J. MCCOSH, M.D., President *pro tem.*, in the Chair.

RESECTION OF ELBOW FOR TUBERCULAR ARTHRITIS.

DR. B. FARQUHAR CURTIS presented a young woman upon whom he had operated two years ago for tubercular arthritis of the elbow, mainly synovial in character. Primary union was obtained following the resection, and motion was begun in three weeks. The course of the disease was entirely stayed, except for a sac which had begun to form over the point of the elbow about a year ago, which suppurated, and was incised about six weeks ago. The arm was now quite useful; the lateral ligaments were solid. The disease had existed nine months

before the operation, and had caused such severe muscular spasm as to simulate anchylosis.

The point which he wished to emphasize was the after-treatment which he always adopted after resection of the elbow. After securing primary union, three weeks after the operation he put on a splint so hinged as to allow of flexion and extension, but not of rotation, the hand being kept in complete supination. The patient then made active motion by resting the elbow on a high table, the forearm being vertically upright, and rocking the forearm back and forth. In Dr. Curtis's experience passive motion had not been necessary. Usually the splint could be dispensed with after nine or ten weeks, and during this period no lateral motion or rotation was allowed lest it should weaken the lateral ligaments and impair the solidity of the joint.

Dr. Francis H. Markoe described a case of pure synovial tuberculosis of the elbow-joint. Some five years ago an iron-worker presented himself with a very much enlarged elbow-joint, and on making incision a large amount of sero-pus, with some rice bodies, was evacuated. He washed out the cavity, making no excision of the joint. A small piece of tissue taken for microscopic examination confirmed the diagnosis of tubercular disease. The wound was closed without drainage, and healed primarily. He saw the patient again four years afterwards, when the joint was freely movable and perfect. The case reminded one of similar results from opening the abdomen for tubercular peritonitis.

LIGATION OF BOTH EXTERNAL CAROTIDS FOR INOPERABLE NASO-PHARYNGEAL SARCOMA.

Dr. R. H. M. Dawbarn presented a young man with sarcoma of the naso-pharynx, springing from the right middle turbinated bone. It had probably begun more than a year ago, although he first sought treatment from Dr. Lederman last April. The neoplasm grew with extreme rapidity, presently filling the right posterior naris and spreading to the pharynx, and seeming to have vascular attachments to all parts of the pharynx. It bled on the slightest touch. Dr. Lederman tried antitoxin treatment very faithfully, making eleven injections altogether, and on each occasion getting a severe constitutional reaction. No effect was produced on the size of the growth, and, as the patient was becoming very weak, it was discontinued. He was then turned over to the surgeons, and Dr. Wyeth decided that, owing

to the great size and vascularity of the growth, it would not be advisable to attempt its extirpation, for the patient would likely die on the table. Dr. Dawbarn then tied both external carotids with the hope of causing some shrinkage of its growth. The operation was done in June. In September the growth had diminished to one-third its former size, and at present to one-fourth, so that the removal of the remains of it could now probably be easily accomplished.

The pathologist had reported the case as one of small round-cell sarcoma.

Dr. Joseph D. Bryant said his own experience with ligation of the external carotids for the purpose of limiting the extent of morbid growths had been limited to three cases. Two were cases of malignant disease of the lower jaw; one was a myxo-sarcoma, and involved the naso-pharynx about as in Dr. Dawbarn's case, if he could judge correctly by the description given. The first case was operated upon in 1887, the next in 1889. Both arteries were tied simultaneously in these instances, and in both there was diminution in the rapidity of the growth. But while the growth was thus influenced, the cachexia continued in one case, and when he saw the patient last he was of opinion that he could not survive much longer. The growth itself, however, had not gained in size after the ligation. In the second case the malignant disease had involved the right inferior maxilla and floor of the mouth. This patient had been operated upon some time before by Dr. J. Williston Wright, and the facial artery of that side had been tied at the situation of the submaxillary gland. The patient refused further operation, except tying of the external carotids, performed by Dr. Bryant. He died within four or five days of secondary hæmorrhage, caused by sloughing of the growth incident to the diminished blood-supply resulting from ligature of the external carotid. It was the first death from this cause after ligation of the external carotid up to that time. However, examination very quickly revealed the reason for the secondary hæmorrhage in this instance,—namely, origin of the facial from the common carotid at its division into the external and internal carotids. Therefore its circulation was not controlled by ligation of the external carotids.

Dr. Bryant said that in 1887 he read a paper before this Society, based on the two cases just referred to, in which he drew the following conclusions among others:

(3) Simultaneous ligature of both external carotids is a rational

preparatory measure for operations involving the parts supplied by their branches when dangerous hæmorrhage is feared. If the pharynx is involved, the ascending pharyngeal branches should be ligated also.

(4) Simultaneous ligature may be advisable to diminish the rapidity of the development of extensive malignant growths when they are nourished by the branches of the external carotids.

The fourth proposition was then received with a great deal of doubt by the members of the Society, and the late Dr. Sands characterized it as a measure which he should hardly expect to be entitled to the consideration which Dr. Bryant had seen fit to give it at that time.

The third case was one of myxo-sarcoma of the naso-pharynx, the growth being very vascular. Dr. Bryant snared it on several occasions, and as a result on one occasion the patient came near dying of hæmorrhage. But recollecting this fourth proposition, he made up his mind to ligate both external carotids, and at the same time or subsequently remove the upper jaw. June 19, 1888, the external carotids were ligated simultaneously, and the upper jaw of the left side was removed at the same operation. The only jet of arterial hæmorrhage was from anastomosis of the facial with the ophthalmic. At the conclusion of the operation the vascularity of the tumor was so greatly diminished that he concluded to let it alone for a week before attacking it with the cautery, caustics, or other measures. But it continued to diminish without further treatment until it reached not more than one-fourth its former size, and when he last saw the patient, two years ago, it was in the same condition as about four years previously, was causing no inconvenience, and all evidences of activity were absent. Whether or not the tumor would have continued to increase had he not ligated the external carotids he could not say, but there could be no question of the fact that following the operation there had been no further growth.

Dr. Dawbarn had added another case to a very interesting class which seemed to point to the fact that ligature of the external carotids not only arrested the vascularity of these tumors, opening the way for an operation, but that it might also prevent further development.

DR. DAWBARN said that this patient had been markedly cachectic before ligation of the external carotids, so that it was doubted whether he would be able to stand even this simple procedure.

During the short time since the operation he had regained his healthy appearance, no longer seemed anæmic, had gained twenty pounds in weight, and stated that he felt better than he had in two years. Dr. Dawbarn thought it was too much to hope for the ultimate result to be as favorable as in Dr. Bryant's case, for he expected that after a time the tumor would resume its growth unless the patient submitted to an operation.

INGUINO-PERINEAL HERNIA.

DR. W. B. COLEY presented a man, twenty-two years of age, who had had a hernia since infancy, but had never worn a truss. When first seen by Dr. Coley, September 1, 1895, it was the size of a cocoanut and was associated with a small inguinal hernia of the ordinary type on the left side.

The pouch containing the right hernia was entirely separate from the scrotum and was made up of the skin of the thigh and perineum. The right half of the scrotum was flat and empty, the testis occupying the bottom of the abnormal pouch described.

He was operated upon October 7, 1895; the entire pouch was removed and the inguinal opening, which was of sufficient size to admit three fingers, was closed by two rows of buried kangaroo tendon sutures applied according to Bassini's method. The testis which was found at the extreme bottom of the sac, which was of congenital origin, was considerably atrophied, and it was thought best to remove it. The wound was closed without drainage, except a bit of gauze in the perineal end, and perfect primary union followed.

Of this rare form of hernia, this case, as far as he had been able to ascertain, was the only case that had been observed at the Hospital for Ruptured and Crippled. It is nearly always of congenital origin, and the testis is found at the bottom of the sac. In one case observed by Macready the hernia had descended into the perineum, while the testis had remained in the abdominal cavity.

Twenty-two cases of this variety of hernia have been observed at the London Truss Society and tabulated by Macready. The testis was found to be of full size in one case and very small in eight. In four cases the testis could be returned into the abdominal cavity along with the hernia.

RAPID RECOVERY FROM HERNIA OPERATION.

DR. COLEY presented a second patient, a man, to demonstrate the fact that it was not necessary to keep patients abed four or five

weeks after operations for hernia. In this case he had operated only three weeks ago for large inguinal hernia, yet there was no swelling of the testicle and the cord was of normal size.

INFLAMMATION OF THE PAROTID GLAND.

Dr. B. F. Curtis presented a woman with a swelling involving the right parotid gland, the nature of which was obscure. She was twenty-eight years of age, had always been in good health, had had no dental trouble farther than one slightly diseased tooth; there had been no mumps in her neighborhood. He first saw her four weeks ago, a month before which time she had suddenly been attacked with severe pain in the right cheek, followed by swelling. When the swelling came the pain subsided. She knew no cause for the attack. There was no trismus, the mouth opening freely. Examination of the cheek showed the surface somewhat reddened; the border of the parotid could be felt as a hard edge under the skin and adherent to the latter. The feeling was as if the parotid gland had been injected with wax. Pressure on the tumor caused the discharge of a few drops of thin pus from Steno's duct within the mouth. After enlarging the duct a trifle, the probe passed freely into it, and revealed no foreign body. Extensive sloughing was feared, and to avoid disfigurement he introduced a probe into Steno's duct, and through an incision behind it broke up the dense tissue of the gland with the finger, passing the latter from the mouth through the substance of the cheek to the skin without wounding the latter. The wound was packed with gauze and the induration subsided somewhat. Recently there had been escape of a little milky fluid (evidently mainly saliva) through a small external opening. The wound in the mouth had healed, but the duct was still free, and the probe passes through Steno's duct and out at the opening on the cheek. The pus had been examined microscopically and bacteriologically, with practically negative results. The staphylococcus albus was present. Actinomycosis had been thought of, but there was not sufficient involvement of the skin. It was possible there was a foreign body softer than a stone which the probe and finger had not detected.

EXTIRPATION OF CARCINOMA OF TONGUE.

Dr. Charles K. Briddon presented a man, sixty-three years of age, who had been admitted to the Presbyterian Hospital, October

21, 1895, with a growth upon his tongue extending from its centre to its base. It had begun to ulcerate. The submaxillary gland and adjacent lymphatic nodes were enlarged, but the general state of the patient was good. The development of the growth in tongue was first noticed three months before. Microscopic examination of a wedge of tissue from the growth showed it to be epithelioma. The floor of the mouth was not involved. October 23 the tongue was removed; as a preliminary the right submaxillary gland and some adjacent lymphatic nodes were removed and both lingual arteries were ligated. The patient then having been brought to the edge of the table and held in a sitting posture, the mouth was opened and the tongue drawn forward and severed at its base from its attachments, immediately in front of the glosso-epiglottidean fold. The section was bloodless.

The stump of the organ was painted with Whitehead's solution and his mouth kept clean with listerine and peroxide of hydrogen. He received fluids by mouth on the second day and was able to swallow without difficulty. On the seventh day he received regular diet. It was necessary to dress the wounds on his neck daily for a short time on account of the fact that continual secretion from the mouth came in contact with the dressings. Under this treatment they progressed steadily and were entirely healed in three weeks. Patient sat up out of bed on the tenth day, and since then he has improved rapidly. At present he feels better than at any time in the past four months.

OBSERVATIONS ON THE USE OF OXYGEN GAS WITH ETHER FOR ANÆSTHESIA.

DR. FRANCIS H. MARKOE read a paper on this subject, in which he dwelt upon two points,—first, that it prevented the cyanosis so common with ether alone; and, second, that if anæsthesia was induced by oxygenated nitrous oxide it could be most satisfactorily and safely prolonged with oxygenated ether. It was also suggested that anæsthesia by chloroform might be made more safe.

DR. ROBERT ABBE said his experience with this method had been limited, but as far as it had extended it seemed to show that it possessed advantages. That there was a gain in oxidation during etherization could not be questioned. The patient's complexion was more pink, the blood in the wound was more arterial, the minute arteries seemed to spurt more, but clotted quickly, so that there was no

greater hæmorrhage. The effect upon the patient also seemed excellent. During the past ten days he had used it twice in private practice, and found patients glad to have this additional safeguard in the use of ether. There was no difficulty in sending a small can of the oxygen gas to the patient's house. Its use had been attended by less secretion of saliva and from the bronchial glands than where ether alone had been employed. The patient had experienced less nausea subsequently, and the effects had been pleasanter. A lady who had once been operated upon by Dr. Sands had very unpleasant recollections of the etherization, whereas by this method no unpleasant sensations had been experienced. In another case of mitral lesion which caused the father and family physician much anxiety, the patient withstood the anæsthesia and a long operation very well, and had experienced no nausea. Dr. Abbe used and preferred a cone made with paper and a towel.

DR. BRYANT said he had had only one opportunity to see ether administered in combination with oxygen, and he did not regard that case as a fair test of the method. It was seventeen or nineteen minutes before the anæsthetist announced that the patient was under its influence. When the first incision was made the patient shrank from the knife, and further time was allowed. The patient drew away the second time, but less than the first. During the "clearing out" the axilla she shrank considerably from the manipulations. If all patients acted in this manner under the anæsthetic he would regard it as dangerous in cases of delicate operations. However, as stated at the outset, he did not think it a fair test, one reason being that the patient was unbalanced mentally at the outset.

DR. B. F. CURTIS said he had tried the method in about ten cases, and was compelled to admit that he had not witnessed much improvement over older methods. The author had stated that there was no cyanosis in the majority of his cases, but there certainly was in some of Dr. Curtis's. This had been a great disappointment to him, for he had supposed that cyanosis was the principal disagreeable symptom which could be prevented by the use of oxygen. In one case in particular, that of a young man of eighteen, in fairly good condition, subjected to an operation on the inguinal glands, the patient was blue throughout the operation. Whether the etherizer was to blame he could not say. The duration of the stage of excitement differed. In some of his cases it was quite prolonged, and there was nothing in the history of the patient to account for it. Like

Dr. Bryant, he had in some cases observed want of efficient anæsthesia, and he suspected that it was due to the diminished quantity of ether inhaled when administered in this way. One advantage of the method was the fact that there was less vapor of ether in the room, proving the economy in its use. It was possible that the use of compressed air driven through the cone would have the same effect as oxygen. The effects on the blood seemed to be about as described by Dr. Markoe, but perhaps this advantage also was due to the fact that the patient got less ether. In one case in which he had kept the patient waiting about two weeks to get rid of a bronchitis before undertaking some trivial operation, it was noticeable that there was absolutely no irritation of the bronchi after the operation, although there had been râles only two or three days before.

Dr. Curtis would warn against the use of oxygen with nitrous oxide. He had tried it in an experimental way over and over again, and had found that the oxygen had no effect whatever, except in diminishing the anæsthetic influence of the nitrous oxide. Nitrous oxide alone would give very satisfactory anæsthesia, but if oxygen were added it would simply prolong the stage of excitement which was present when nitrous oxide was not given in concentrated form and lessen the anæsthetic effect.

Dr. W. W. Van Arsdale agreed with Dr. Markoe that the ideal anæsthesia of the future would probably begin with nitrous oxide and be continued with ether. He had used this form in private practice for two years, and had been fortunate in having an experienced administrator assist him. By giving pure nitrous oxide and afterwards substituting plain ether the patient could be placed remarkably, alarmingly quickly under anæsthesia, sometimes in half a minute, and without any disagreeable sensations or period of excitement, and without any of the after-effects following the use of ether alone. This certainly was ideal, and he thought we would all come to adopt it. At present the only thing against it was expense, which was a great drawback in some hospitals.

Dr. Van Arsdale said he had had no experience with the use of ether mixed with oxygen. Clinically we found surgeons on the opposite side from what we might expect from physiological considerations. Physiologically we would like our patients to be as free as possible from cyanosis, and he had always thought that the ideal anæsthesia would be that in which the patient exhibited no signs of cyanosis whatever. On the other hand, there were a number of clini-

cians who stated that if they could induce ether anæsthesia with the help of cyanosis it was much to the benefit of the patient. It required less ether. They, therefore, adopted some form of Clover inhaler whereby the patients were compelled to breathe their own exhalations over and over, and were thereby deprived of oxygen. A great deal of ether introduced into the system had a pathological influence, which was avoided to a degree by this method. On the other hand, he had heard of one case in which the ether was taken through the Clover inhaler with the result that the patient became very cyanotic, the anæsthetic had to be discontinued, the patient died after two or three hours, and the autopsy revealed thrombi in the pulmonary vessels. This seemed to be one of the dangers of too much cyanosis during anæsthesia. The new method of mixing oxygen with the ether impressed him as a step in the right direction, but he was afraid that clinically it would meet with some objection. More ether had to be given, which was not a desideratum; if there were less cyanosis, that would be an advantage in itself.

Dr. Howard Lilienthal had used nitrous oxide at the beginning of anæsthesia and had been almost alarmed at the rapidity with which the patient became anæsthetized. A method which would do away with cyanosis would rob us of one of the danger signals. He also mentioned the fact that this mixture of oxygen and ether was probably highly inflammable, if not explosive, and therefore should be used with extra precaution.

Dr. McCosh had used the combination of oxygen and ether in eight or ten cases recently, and had found the chief objection to lie in the fact that it was difficult to bring the patient under the influence of the anæsthetic, and relaxation had not been complete. During the greater part of the time before unconsciousness the patient was in a jolly mood. There was an absence of the distress which ether usually caused, there was no cyanosis, and the blood was well aerated. Some years ago the method had been extensively employed, the tube conveying the oxygen passing into a cone made of paper and a towel, and after use in fifty or sixty cases it had been abandoned. Regarding the combination of nitrous oxide and ether, it was much used in this city about ten years ago, but it was rather troublesome, and unless the anæsthetizer was a man of experience, the patient was apt to regain consciousness on changing from nitrous oxide to ether.

Dr. Francis H. Markoe said the discussion had brought out just the points which he had expected. They were such points as had

been ventilated by Mr. Hewitt, of London, during his experience with nitrous oxide alone. It had been claimed that anæsthesia with nitrous oxide alone was easy, while with nitrous oxide mixed with oxygen it was very difficult. In fact, it would not occur at all unless the percentage of oxygen was not greater than eight or ten in a hundred. Mr. Hewitt had devised a means for making the proportion of the two agents definite. He began with a large amount of nitrous oxide, then admitted oxygen up to 8 per cent., then 10 per cent., and was thus enabled to induce perfect anæsthesia rapidly and without cyanosis.

The first requisite, therefore, was to know just how much oxygen was being employed, thereby avoiding undue delay in bringing on anæsthesia. The objection that the method of combining oxygen with ether was not practical in the hands of the most recent hospital interne was a good one, but it applied also to any form of anæsthesia, and constituted a strong argument in favor of a regular anæsthetizer connected with our hospitals. The operator ought to be able to feel that his patient's life was not being imperilled by an inexperienced anæsthetizer. Judging by the remarks of Dr. Bryant and Dr. Curtis, he would suppose their failures with oxygen and ether had been due to this lack of experience on the part of the anæsthetizer.

Dr. Markoe believed with Dr. Van Arsdale that the future method would be to induce anæsthesia with nitrous oxide, but he thought it would be modified by oxygen.

The remaining question, whether the close or open method of anæsthesia was preferable, depended entirely upon the mode of action upon the blood; whether through deprivation of oxygen, or through the specific effects of the drug itself circulating in the blood. His own impression was that the deleterious effect was chiefly through non-oxygenation of the blood.

Regarding the difference in the ability of anæsthetizers to bring patients quickly under the influence of the drug, he had often noticed that one assistant had no difficulty in rapidly anæsthetizing a patient, while another could scarcely succeed at all.

LATE TYPHOID PERFORATION OF INTESTINE; OPERATION; DEATH.

Dr. Charles K. Briddon presented a portion of intestine and related the following case: A youth, eighteen years of age, had been

admitted to the Presbyterian Hospital, October 9, 1895, having been seized three days before with acute peritonitis. It was learned that he had suffered from typhoid fever some weeks before, and had been discharged convalescent from a hospital in Galesburg, Ill., on September 22. Since that time he had seemed to be well in every way, until the recent sudden development of abdominal pain. The abdomen was at once opened in the median line from just below umbilicus to just above symphysis. The small intestine presented in the wound. It was distended, congested, and covered with inflammatory exudate. There was a considerable amount of pus in the peritoneal cavity. The intestine was drawn out of the wound and careful search was made for a point of perforation. It was examined with orderly precision, beginning with the cæcum and working upward. Appendix found normal. About nine inches above the ileo-cæcal junction a perforation was found situated opposite to the mesentery, and from the orifice of which the thin fæcal contents spurted a considerable distance. No evidence of any adhesions. No other perforations found. The perforated gut was drawn into the wound and the perforation closed by means of a double layer of Lembert's sutures. The peritoneal cavity was washed out with a large amount of normal salt solution. A tampon of iodoform gauze introduced. Wound left open. Patient failed rapidly after operation, and died at 10.45 P.M. on same day. Autopsy showed the perforation tightly sealed. No other perforations. Peyer's patches in lower ten inches of ileum markedly ulcerated.

DR. ABBE said that last winter he had operated upon a patient for intestinal perforation the third week after recovery from typhoid fever and two days and a half after the perforation had taken place. During the two days and a half he had been treated by a physician with opium, etc. Dr. Abbe found the lower half of the abdomen full of pus and fæces, the upper half somewhat sealed off. A wide opening was found and sewed up, the cavity thoroughly irrigated, and the patient recovered.

There had been five successful operations in different parts of the world for typhoid perforation, the shortest interval between the perforation and its closure having been five hours (Van Hook, of Chicago), the longest two days and a half (Abbe's).

TRANSACTIONS OF THE SECTION ON GENERAL SURGERY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA.

Stated Meeting, October 11, 1895.

DR. OSCAR H. ALLIS in the Chair.

INJURIES TO NERVES FOLLOWING FRACTURES OF THE HUMERUS AND CLAVICLE.

DR. G. G. DAVIS read a paper on this subject. (See p. 147.)

DR. A. B. HIRSH recalled a case of radial paralysis in which he had dissected the nerve from a mass of cicatricial tissue, which was followed by very good results. It was a simple fracture, and the nerve-trunk was embedded in the callus. There was an oblique fracture of the radius and ulna. It was necessary to suture the nerve; the ends were split, turned, and overlapped.

DR. O. H. ALLIS remarked that the two cases of Dr. Davis were very unlike. In the case of fractured clavicle there was no primary injury to the nerve, but it followed displacement which occurred several days afterwards. Such cases are not so interesting because they are clear-cut; but those cases of injuries to nerves in fractures of the elbow-joint, which occur frequently, deserve more attention than they generally receive from the profession. He had had five cases of this character. Sometimes spiculæ of bone project and transfix the nerve. In one specimen in his possession there is a projection resembling a thorn on a rose-bush. In that case pressure upon the nerve made the child wince, and on cutting down he had found the nerve transfixed by this spine; as the nerve was pulled upon in moving the forearm, it caused pain and tetanoid spasm. It was three years after the injury when the case came into his hands. About three inches of the nerve would have had to be resected, and,

as the nerve below the injury was very much atrophied, he doubted if the case would have been benefited by an attempt at resection. In another case a child was playing on a gate and a heavy bar came down on the anterior aspect of the elbow-joint. There was œdema of the structures and compression of the nerve. He made a lateral incision and chiselled away some projecting bone, but without material good results. He had seen five cases of the kind reported by Dr. Davis, and he agreed with the reader of the paper that the injury of the nerve is primary and a part of the original injury, and also in the opinion that an immediate operation would be advisable. In all cases of this kind, especially in fractures involving the elbow-joint, he advised most careful examination, for when this is done generally there will be better results. Fractures, in his opinion, are the least satisfactory of all the work the surgeon is called upon to do. In obscure cases it is better to cut down and expose the fracture in order to secure perfect apposition, and he therefore very readily concurred in the recommendation for immediate operation. These cases have great interest, because no one knows when he may be a defendant in an action for the results of such injuries.

Dr. John B. Roberts said that he had seen a case last winter that might be interesting in this connection. It was a case in which he wanted to operate, but delayed, and finally found it unnecessary. The child had been injured about six weeks before. There had apparently been an epiphyseal separation of the lower end of the femur with displacement backward into the popliteal space. The lower fragment could be easily located, and there was foot-drop, showing injury of the external popliteal nerve. He advised operation to release the nerve from pressure, but the other physicians preferred to wait. The child got perfect use of its foot from regeneration of the injured nerve, and can now walk well and has no paralysis.

LOOSE CARTILAGES REMOVED FROM BOTH KNEE-JOINTS.

Dr. Thomas S. K. Morton reported the following case: O. C., aged thirty-five years, was admitted to the Pennsylvania Hospital August 12, 1895. Three years previously his left knee had been injured. The result was considered a simple sprain. Six months before admission the right knee was likewise sprained, but to a much more

serious degree. Since then he has had constantly increasing difficulty in walking. Something is said to frequently lock one or other of the joints, but he is never thrown down thereby. He describes what have probably been attacks of synovitis as frequently following these lockings of the joints.

Examination demonstrated the presence of one large, flat, loose body in the right knee and two in the left. Of the latter, one was of medium size and the other quite small. All were remarkable in that they could be moved at will into any portion of the joint,—to either side, beneath the quadriceps tendon, or out of sight or touch into the interior of the articulation. It was also apparent that the internal lateral ligament of the right knee had been partially ruptured, for when the joint was flexed through about one-quarter of its normal arc of motion a partial dislocation of the tibia inward upon the condyles took place. There was some thickening and great tenderness of the synovial fringes in each articulation; especially the right, in which also there was a little effusion, probably as result of a recent synovitis following sudden locking. The man stated that he was unable to follow his occupation in his present condition and desired operative relief. He recently had been laid up much of the time cooling off inflammation of one or the other or both of his knee-joints.

On August 13, operation was performed. Salt solution alone was used as a douche and for sponges. The bodies had been fixed in good positions for extraction before anæsthesia was induced, and there held by aseptic bandages. A one-and-a-half-inch incision was made upon the inner side of the patella of each knee, and the capsule divided to a similar extent. The capsule and synovial membrane of the right knee were found thickened as a result, apparently, of chronic inflammatory action. About an ounce of clear fluid escaped from the cavity. A loose body was easily extracted through the incision by means of a small vulsellum forceps. This proved to be one and a quarter inches by one inch in diameter, irregularly circular, convex slightly upward and varying from one-eighth inch to one-quarter inch in thickness. It was composed of bone and cartilage. From the left knee was taken a similar body three-quarters inch by one-half inch in diameter. The second and smaller body previously located in this joint could not be found, although careful search was made for it. Both wounds of the capsule were united by continuous catgut sutures, after flushing the joints with salt solu-

tion. The skin-wound in each case was brought together with silk. Posterior knee-splints were applied outside of the dressings.

On August 20 the wounds were dressed. Primary union was found to have taken place. There was a little effusion in each joint. The temperature had not risen above 99° F. at any time since the operation. Plaster casts were applied August 25, and the patient permitted to get up. The casts were worn until September 3, when they were thrown aside, and the man found himself able to walk much more freely than before operation. An elastic support which would permit but little flexion was applied to the right knee. All effusion had disappeared from both joints.

On November 17 this patient was again examined. He stated that he was absolutely well as regards the left knee. That the right knee was also perfectly good for all ordinary purposes, but, of course, if he did not wear some apparatus to prevent full flexion the disagreeable and somewhat painful subdislocation above described would occur. There was no thickening in the left knee and much less than before in the right. No fluid was present in either joint. He could walk perfectly. The small body in the left knee which had eluded search at the time of operation could be detected, but was giving him no trouble whatever. He was directed to procure a steel and leather brace for the right knee, which would prevent more than a moderate amount of flexion, so as to avoid recurrence of the occasional subdislocation incident to the old rupture of the internal lateral ligament.

DR. DAVIS remarked that sometimes these bodies in the knee-joint are very elusive; they come and go, and the smaller they are the more likely they are to disappear before and at the time of operating. It is extremely difficult to keep them in position until they can be extracted. In a case upon which he had operated, in which the body was only about half an inch square, it came out and lodged to the side of and above the patella. Before giving an anæsthetic, he fixed the body by his thumb, pushing it downward. Had he not done this the struggles of the patient during the administration of the anæsthetic would have pushed the body backward, as it had done several times before. He held it until the patient was fully anæsthetized, then made an incision down to the capsule and forced a needle into the body through the capsule before opening the joint. The wound was then enlarged and the body lifted out. An attempt at fixation, by transfixing the body through the skin, did not succeed,

because he could not satisfy himself that he had transfixed it; but this method of fixing the foreign body, with the thumb holding it in its position until removed, was found perfectly satisfactory.

Dr. Le Conte had had a similar experience to Dr. Davis some years ago. A patient had several loose bodies in his knee-joint. He had tried to transfix them with a needle, but they were so hard that the needle would not penetrate. The patient claimed that he had three bodies in the knee-joint. Dr. Le Conte had only been able to distinguish two, but on opening the joint he found and removed three. The patient was then kept in bed for two weeks before using the limb. On walking across the room at the end of this period, the knee-joint again locked and he was thrown to the floor. Another loose body was felt and removed.

In another case, occurring about a year ago, a man had loose bodies in both knee-joints with an acute synovitis of one joint as a result of a fall. At first, Dr. Le Conte hesitated about opening the inflamed joint; but finally concluded to do so, and was struck with the marked difference in appearance between the two joints: one was clear of effusion and normal, while the other was greatly distended with a bloody effusion filled with flakes of lymph. The ligament and synovial membrane were very much thickened and filled with dark blood. Irrigation was not used, and both joints were closed in the same manner with catgut sutures. A slight effusion followed the operation in the joint that was previously distended, but this rapidly subsided, and the patient made an uninterrupted recovery.

Dr. John B. Roberts had in a similar case fixed the body by piercing it with a needle through the skin, but there are some cases in which it is difficult to penetrate it on account of its density. In one case he had operated for an osteoma growing from the condyle, but within the joint. It was so hard that he had to chisel it off.

Dr. Alfred C. Wood referred to the case of a man who came to the hospital complaining of pain in the knee-joint following an injury. It was learned that while in the act of wheeling a loaded wheel-barrow he had been struck on the inner side of the right knee. Severe pain was experienced at once, and continued up to the time he applied for advice, although he continued to use the limb. Examination of the joint revealed a moderate degree of synovitis and a loose body beneath the skin, one-half to three-quarters of an inch in width and an inch and a quarter in length, which from its position

appeared to be a part of the right semilunar cartilage. The patient refused an operation for its removal, or even to give the joint rest.

It is probable that at some subsequent time this fragment will give rise to the usual symptoms of a foreign body in the knee-joint, for which he will be obliged to seek relief.

It occurred to him that this case would explain the etiology of these bodies in certain cases.

Dr. Thomas S. K. Morton recalled a case of a man who had a loose body in the knee-joint for a long time. It occasionally would throw him down while walking, and at other times it could not be found. He was brought into the hospital, but the body could not be located, and he returned to his work. Upon the next occasion when the joint locked he found the body and held on to it until he reached the hospital. In order to retain the body in its position, Dr. Morton's father hit upon the idea of flexing the leg and keeping it in this position with a bandage while the anæsthetic was given. This expedient worked to a charm in this case, and when the capsule was incised the body came out like a pea from its pod.

CASE OF ABDOMINAL SECTION FOR MULTIPLE GUNSHOT WOUNDS OF THE INTESTINE, COMPLICATED BY TUBERCULAR PERITONITIS.

Dr. Thomas S. K. Morton reported the following case: John H., aged thirty-two years, colored, was admitted to the Pennsylvania Hospital, November 3, 1894, at 1.30 A.M. He had been shot at close range with a 32-calibre revolver, and had walked half a mile to the hospital a few moments after the shooting. Upon admission he was found to be conscious but much intoxicated. There was a wound half an inch below and half an inch to the right of the umbilicus, through which a probe entered the abdominal cavity. Temperature was $96\frac{1}{5}^{\circ}$ F., but by the time that he was seen by the reporter this had mounted to 98° F. under active applications of heat and stimulation. Evidences of a large amount of blood in the peritoneal cavity were developed.

Ether was administered, and a five-inch incision in the median line was made, having the umbilicus for its centre. At once, upon opening the peritoneum, a great quantity of arterial fluid blood and some dark clots gushed forth. This was quickly found to originate from

wounds of the mesentery. The incision was increased to eight inches, and an assistant's hand was placed upon the aorta within the abdomen at as high a point as possible. This effectively controlled the hæmorrhage while the bleeding vessels were taken up and ligated. Six wounds of the mesentery, ten of the small intestine, and one of the meso-colon over origin of the internal iliac vein upon the left side were discovered by systematic search. It was also noted that the man was suffering from tubercular peritonitis, the entire peritoneum being studded with the typical nodules of that infection. Numerous old adhesions were found scattered throughout the abdominal cavity, and considerably hindered the necessary manipulations.

There was free extravasation of the contents of the small intestine. The entire alimentary canal was loaded from œsophagus to anus with undigested food and fæces, which poured out of the intestinal wounds upon the slightest handling. The bleeding from the mesentery was controlled by a few ligatures and through and through continuous sutures of silk. The intestinal perforations were closed with Lembert sutures of the same material. The ball was traced into the left psoas muscle, but was not farther followed as no bleeding came out of the muscular wound. A thorough irrigation of the entire abdominal cavity was made with hot salt solution. Glass drainage was employed. The time consumed by the operation, from incision to end of dressing, was one hour and fifteen minutes.

Death upon the table was narrowly averted, but a lethal issue resulted four hours later from shock, incident, probably, to the great loss of blood before hæmorrhage could be checked by pressure upon the aorta, in addition to the preceding tubercular peritonitis.

Post-mortem examination revealed no additional wounds, and no more hæmorrhage had occurred. All of the wounds were found adequately sutured. The peritoneal cavity was absolutely clean and dry, save the tubercular process and adhesions. The ball followed the psoas muscle, into which it had been traced at the operation, until near the pelvic brim, when it entered and lodged in the muscular mass of the pectineus and adductor muscles in the upper portion of the thigh.

Dr. G. G. Davis called attention to the lack of disabling quality of small-calibre bullets, a matter which is bound to assume more prominence in the near future on account of the tendency of military authorities to adopt fire-arms of extremely small calibre. He did not believe, if that man had been shot in the abdomen and had received

ten wounds of the intestine by a bullet of 38, instead of 32, calibre, that he would have been able to walk six squares to the hospital after receiving his wounds. It is a marked example of the effects of bullets of small calibre in failing to disable the wounded individual.

DR. ALLIS remarked that the large incision, in dealing with such cases, is a very important point, for the sooner one can get the intestines out to examine them the better. Another point is to disregard certain injuries for a time and pass on to more important ones. Thus, when there is a wound in a viscus, in the stomach, or in the small intestine, if there is no evidence of bleeding, it seems wise to disregard this and go at once to the repair of wounds of the mesentery, where the bleeding may be very great. A boy was brought into the Presbyterian Hospital, who had fourteen openings in the intestines; the ball was found in the lower part of the abdomen. The openings were all sewed up, but the child died of shock and peritonitis two days after the operation. The wounds in the intestines were all found to be healed at the autopsy. In these cases it is of the greatest importance to do quick work.

ILIAC DISLOCATION COMPLICATED WITH FRACTURE OF THE HEAD AND NECK OF THE FEMUR AND OF THE EDGE OF THE ACETABULUM. ARTHROTOMY.

DR. JOHN B. ROBERTS reported the following case: In March, 1892, there came to him a man, twenty-five years old, who, three months previously, had sustained a railroad injury by being caught between bumpers while coupling cars. He had been examined under ether by physicians soon after the injury and again about a month later. During three weeks of this time he had been treated with permanent traction to the leg after Buck's manner of treating fracture of the thigh. The head of the left femur was evidently dislocated upon the dorsum of the ilium. While an attempt to reduce this old dislocation was being made, using the compound pulleys, the possibility that the neck of the femur had become fractured was suggested by a grating sound which was heard and the diminution of the shortening of the leg. The leg had been four inches shorter than the right and inverted. After these manipulations, the shortening appeared to be less and the position of the limb more nearly normal; though it was evident that a perfect reduction of the luxation had not been accomplished.

Dr. Roberts believed that he had converted an iliac dislocation into a sciatic one, although it was possible that he had merely caused a fracture of the neck of the femur. The patient was under ether nearly two hours. He exhibited marked shock, and had suppression of urine which nearly ended fatally. He also had localized pneumonia. There was much ecchymosis at the inner side of the upper part of the left thigh, and Buck's extension apparatus was used because of the possible fracture of the femoral neck. His general condition was so bad that no further attempt at interference with the condition of the hip was made until the lapse of over two months.

The symptoms after anæsthesia had been so serious that he would scarcely have interfered again, if it had not been that the disability was great and prevented the man making his living. It therefore seemed proper to cut down upon the hip and endeavor to restore the bone to its normal position, while by the use of chloroform the possibility of suppression of urine could be lessened. Repeated examinations of the urine showed no evidence of albumin or casts. The specific gravity was, however, low just previous to the second operation. Chloroform was administered with great care by Professor Steinbach.

A rectangular incision was made in the gluteal region with its vertical arm just above the point where the head could be felt lying on the ilium and its horizontal arm extending upward from the top of the first incision. After a tedious examination at the bottom of a deep wound, it was found that the neck of the bone had been fractured. The fragments were firmly and closely united by fibrous tissue. The union was not bony. This fibrous union was divided with a knife in order to get access to the head of the bone. Not being able to find the acetabulum, he decided to excise the head of the femur which was lying close in front of the sciatic notch. A portion of the head was then cut away with a chain saw. The rest was removed by means of an osteotome which was driven into the ilium around the head, to separate it from the surface of the ilium to which it seemed to be attached. It seemed to be welded to the ilium as if by callus. The wound was closed and a drainage-tube inserted.

A short time after the chloroform inhaler had been removed from his face, and before the wound was closed, the patient ceased breathing. Elevation of his legs, the institution of artificial respiration, and the administration of oxygen by inhalation relieved these urgent symptoms. The patient became conscious and did fairly well

for about an hour, when he died ; apparently as the result of a heart clot, which probably occurred at the time of collapse, which happened before the wound was closed.

At the time of operation Dr. Roberts was unable to determine with his finger the situation of the acetabulum. This surprised him very much, and added somewhat to the difficulty of the operation, as it delayed him in getting a correct understanding of the relation of the parts. The difficulty in freeing the head was unexpectedly great.

After death the hip was examined through the operation wound, though no autopsy was made. The acetabulum was completely filled with fibrous material, which had a smooth, almost glistening, surface. No evidence of the acetabular cavity could be found by the finger, and there was no deep socket at the point close in front of the sciatic notch from which he had removed the head of the bone with difficulty at the time of the operation. He scooped out this fibrous mass in one piece by carrying a knife around the inside of the acetabulum, which he located by its anatomical situation. The fibrous tissue exhibited completely filled the cavity. This filling up of the cotyloid cavity he thought had resulted from the ruptured capsular ligament falling over it when the dislocation originally occurred.

The bony specimens consist of three pieces,—the upper end of the shaft of the femur with the attached trochanters and part of the neck ; and two portions of the femoral head, to each of which portions of the ilium are attached. The head is in two pieces, because in the operation a chain-saw was used to cut away a portion of it after division of the fibrous bond of union at the seat of fracture. The surrounding ilium was cut with the osteotome before the head of the femur could be removed from the point where it lay.

An examination of the specimen indicates that the head of the bone had been split at the time of fracture ; for there is a piece of bone united at one side of the main portion of the head in an irregular manner ; and thrust deeply into the cancellated portion of the head is a mass of soft tissue, evidently a tendon and muscular fibres. It looks as if the cancellated centre and part of the hard circumference of the head had been burst asunder, as it were, by the neck being driven into it, and that soft tissues had been subsequently entangled between the end of the broken neck and the fragments of the head.

The head is partially surrounded by a concave portion of bone

which is evidently part of the edge of the acetabulum. This is fastened to the convex surface of the articular cartilage covering the head, to which it is closely applied, by fibrous adhesions which at some places are very firm, making an almost bony union. Around some portions of the head there exists a sort of fibrous capsule, which is pealed off with comparative ease from the articular cartilage on the head of the bone.

The upper end of the femoral shaft which was obtained after death shows nothing particularly interesting. The fractured end of the neck does not exactly correspond with any bony surface on the other specimens; but some small fragments broken off at the time of operation may not have been preserved.

It is probable that the original injury was a fracture of the head and neck of the femur complicated by a posterior dislocation of the head of the femur, which in its passage backward carried with it a part of the posterior edge of the acetabulum.

The crepitus felt at the time of the first operation which suggested fracture of the neck of the femur was probably due to the rubbing of the irregular mass of bone among the tissues or the result of having separated the fragments at the seat of original fracture. It is certain that such a fracture as the autopsy revealed in the head and neck could only have been produced by great violence, such as the railroad injury. The bursting of the head and fracture of the neck could not have occurred in a young patient by the efforts at reduction of the luxation.

The head and attached acetabular edge apparently became welded to the ilium close in front of the sciatic notch. There was no deep cavity left at this place from which Dr. Roberts had excised the head of the femur.

The manner in which the acetabulum probably became filled may be understood from Volkmann's case, in which he found a layer of muscle at least a centimetre thick overlying the acetabulum and firmly adherent to its rim. His patient had sustained an obturator dislocation twelve weeks previously which had been converted into a dorsal one six weeks later. Reduction was impossible, though the head and trochanter were exposed by incision and many muscles divided. Investigation showed the acetabulum covered by muscle as above described.

Dr. O. H. Allis remarked that there were distinct epochs in the history of the case reported by Dr. Roberts that render it difficult to

arrive at the primary injury. When Dr. Roberts saw him for the first time there was shortening and inversion. In his attempts to reduce it a grating sound was produced which led him to fear that he had fractured the neck. Two months afterwards Dr. Roberts cut down upon the hip, chiselling away the head, and after death removing other portions. The specimens exhibited show the head of the femur with muscular, tendinous, or ligamentous material driven into its cancellous structure, and within a quarter of an inch of its cartilaginous surface. Interesting questions present themselves,—viz., When did impaction of the head with fracture of the neck take place,—*i.e.*, previous to the dislocation, after the dislocation, or synchronous with the dislocation? If previous to the dislocation, could the unexpended force have dislocated a dismembered head? If the dislocation took place before the fracture and impaction, would fracture and impaction occur after dislocation, when there would be less cause for resistance? The specimen shows a part of the socket fitting well to the head. This would suggest that the crushing force drove the head so violently against the outer rim of the socket, that impaction of the head-fracture of the neck and fracture of the outer rim of the pelvis were the simultaneous result of a single crushing injury. Under the latter supposition it would not be difficult to account for the grating experienced in attempting to reduce the dislocation, since the shaft of the femur with its neck could be readily drawn away from its impaction in the head by means of pulleys. But in such a case would not the head, from which the shaft and neck were separated by traction, remain high up upon the dorsum of the ilium, for there were four inches of shortening at the time of examination. If Dr. Roberts is correct in his opinion that there was impacted fracture of the neck with dislocation upon the dorsum, the case stands alone in the pathology of this articulation.

He thought that the acetabulum has been filled by a blood-clot which became organized. Dr. Roberts had suggested that the capsule might have been drawn over it; but the capsule is covered with epithelium, and the edges which were torn across were also covered with epithelium, and they would simply enclose it, and it could be elevated afterwards. Cases of dislocation, which take place through violence, almost always do injury to the parts, so that blood is poured out into the acetabulum. It had been suggested that the obstruction might have been muscular *débris*. Therefore it is important to ask if there had been any attempt at reduction before the case was seen by

Dr. Roberts? By repeated attempts at reduction, the tissues around the joint may be ground into a mass of pulp, which is forced into the acetabulum.

This was a possible explanation; the head of the femur was ground around on the edge of the acetabulum, which became filled in this way; had those attempts not been made, it was not likely that muscle would be found in this situation. It is of interest in this connection to note that it was easy to remove the mass after death. He did not himself believe in the filling up of the joint in adult life, except in cases where the injury has been very great, as when the patient has been caught between bumpers,—*i.e.*, had received a direct crushing injury.

Dr. Oscar H. Allis showed a specimen of an adult pelvis exhibiting the changes that take place in double congenital dislocation of the hip.

The specimen is presented without a history, except that it was given to the reporter by a student, who brought it from a subject at the dissecting-room. It is an adult pelvis with very old dislocation of both femurs. The acetabulums are atrophied, the heads of the thigh-bones are flattened, and the necks shortened. New sockets have been formed on each side.

DISLOCATION OF THE HEAD ON THE FEMUR CONSECUTIVE TO TYPHOID FEVER.

Dr. A. B. Hirsh reported a case of a girl, fourteen years of age, who had an attack of typhoid fever, complicated by subgluteal abscess-formation, and distention of the acetabulum. When Dr. Hirsh was called in, the head of the femur had slipped up on the dorsum of the ilium, where it remains. The patient walks very well, with a high heel. It is now five years since the dislocation occurred; all apparatus has been laid aside.

EDITORIAL ARTICLES.

MYOMATA OF THE BLADDER.[1]

MYOMATA of the bladder are comparatively rare. Terrier and Hartmann, the two surgeons who have prepared this recent paper upon the subject, have had the opportunity to operate several times upon a patient suffering from this condition, and have verified the diagnosis by an autopsy and by microscopic examination of the tissue removed from time to time. The subject had been deemed of sufficient value to the profession to justify them in preparing an extended article upon the subject. The history of the case already mentioned is given in full, together with the history of an unpublished case in the service of Dr. Gerard Marchand, and a number of cases already reported.

Much care has been exercised in the selection of the cases of true myomata of the bladder from the rather scanty literature upon the subject. Many cases have been published under the name of fibromata of the bladder, and these by many writers have erroneously been classed as myomata. It is true that the gross appearances are very similar in both varieties of tumors, but the picture presented in the field of a microscope is widely different. The cases reported by Birkett,[2] by Humphry,[3] by Cooper Forster,[4] and by Reeves Jackson[5] were not verified by a microscopic examination, and are therefore

[1] Contribution a l'étude des myomes de la vessie, par Felix Terrier et Henri Hartmann, Revue de Chirurgie, March 10, 1895.

[2] Proceedings of the Royal Medical and Surgical Society, London, 1858, Vol. II, p. 88; and Medico-Chirurgical Transactions, London, 1858, Vol. XLI, p. 311.

[3] Medico-Chirurgical Transactions, London, 1859, Vol. XLII.

[4] The Surgical Diseases of Children, London, 1860.

[5] Boston Medical and Surgical Journal, August 25, 1870.

omitted. In the work of Albarran, entitled "Tumeurs de la Vessie," a number of cases are reported; two of these, one of Gersuny,[1] and one of Schatz,[2] are incorrectly classified as myomata; in the first case, the tumor is reported as being composed of a wavy, connective-tissue framework, containing numerous fusiform cells arranged in nests; in the second the diagnosis is telangiectasic fibro-myxoma. Both are omitted. The cases of Virchow, of Santesson, of Thompson, of Guyon, and of Dittel are so briefly described that the diagnosis is a matter of mere speculation; these cases are either omitted entirely, or are referred to only with reference to some special points.

The authors find for purposes of study but sixteen cases on record in which the facts of diagnosis are indisputable: ten mentioned by Albarran in his treatise; two unpublished; four omitted by Albarran or which have been published later; these last cases are those of Faye, of Socin, or Naumann, and of Dupuy and Pilliet.

The case reported by Terrier and Hartmann was a woman, sixty years of age, who entered the hospital Bichat for the first time, May 2, 1890. Until the origin of the present trouble she had always enjoyed good health.

For a month previous to entering hospital her urination had been frequent, painful, and was often accompanied by the passage of clots of blood. Examination showed that the blood came from the urethra, and that, with the exception of a small follicular polypus, which was removed by torsion, the uterus was normal.

After a few days the hæmorrhage ceased, and a more careful examination was made. The woman was quite unable to control the bladder, and her clothing was constantly wet with urine which dribbled away. The vesico-vaginal wall was painful on pressure, and bimanual examination revealed the presence of a tumor the size of an egg in the hypogastric region. It was rounded, firm, and evidently intravesicular, and entirely free from the uterus. Catheteri-

[1] Archiv für klinischen Chirurgie, Berlin, 1876, Vol. XIII, p. 131.

[2] Archiv für Gynäkologie, Berlin, 1876, Vol. X, p. 356.

zation and lavage with warm boric acid solution brought away a few blood-clots from the bladder, but showed nothing further.

On the 9th of June a suprapubic section was done by Terrier and his assistant. A tumor was found to exist in the region of the trigone; it apparently sprang from the mucosa, and by enlarging the incision, and holding the two lips of the wound aside with clamps, it was easily enucleated. Two small nodules in the submucosa by the side of the tumor were also found and removed. The entire mucous membrane of the bladder was red and very vascular.

Examination of the tumor by M. Albarran showed a lobulated mass, with one lobe incrusted with calcareous salts. Under the microscope it proved to be a pure myoma.

The convalescence from the operation was rapid and uninterrupted.

For nearly a year the woman was free from any distress in the bladder, but early in the summer of 1891 a little blood was again noticed in the urine. The urination rapidly increased in frequency and soon became painful, and she returned to the hospital July 29, 1891.

Upon examination the scar of the first operation was found to be ten centimetres long, ending two centimetres above the anterior commissure of the vulva. The lower portion of the scar was slightly depressed, but when she strained the abdominal muscles a small tumor appeared in the scar, and extended down into the right labium majus. Pressure reduced this swelling easily, and the tumor disappeared with a gurgling noise into the abdominal cavity. Catheterization of the bladder revealed nothing of any especial importance, save that the last few drops of urine contained some pus, but no blood. Bimanual examination revealed the presence of a well-defined tumor, the size of a mandarine orange, seated in the hypogastric region just to the left of the median line. It was firm in consistence, movable, and evidently free from the uterus, and within the cavity of the bladder. Urination frequent,—seventeen times in the day and fourteen times at night; painful especially at the end. Urinalysis: 1300 cubic

centimetres, pale yellow, slightly turbid, specific gravity 1016, 12 grammes of urea in twenty-four hours; large amount of albumen; the microscope revealed numerous leucocytes, some red blood-corpuscles, and epithelial cells.

On August 22, 1891, the second operation was performed. After the usual incision down to the bladder, a pair of curved forceps was introduced through the urethra, the blades separated, the anterior wall of the bladder raised upon them and divided between them. A large sessile tumor was found to be attached just to the left of the trigone. It was removed *morcellement*, just as if it had been an intra-uterine fibroma. The operation was practically bloodless. Further examination showed that with the exception of a very moderate thickening along the line of the original operation the mucosa of the bladder showed no abnormalities, and was quite free from nodosities.

The wound was partially closed as before, and a drainage-tube left in place through wound and urethra for six days, when a "sonde a demeure" was substituted. The hernia was guarded against in the closure of the wound. The patient made a good recovery, and left the hospital on September 20.

To the naked eye the tumor thus removed was identical in appearance with that of a fibroma of the uterus. Microscopic examination (M. Lieffring) showed that it was a pure myoma, in all respects similar to uterine myomata, and well supplied with blood-vessels. The size of the muscular fasciculi, and also of many of the individual muscle cells was increased. No mucosa was found in the fragments examined.

In April, 1892, the patient returned to the hospital for the third time. Shortly before this the lower part of the wound had given way, and a fistulous tract had developed, which, as shown by a probe, connected with the bladder. Micturition was again frequent and painful, but there was no hæmaturia. The general condition remained good, notwithstanding the age of the patient.

Palpation revealed another firm, slightly-lobulated tumor mass,

entirely to the left of the meson, and extending to within two centimetres of the umbilicus. So far as palpation could show, the tumor was precisely like a large uterine fibroma. It was slightly movable from side to side, but resisted all efforts to move it from above downward. Bimanual examination showed that the cervix and the body of the uterus were crowded below the tumor. With the assistance of a sound passed into the bladder the vesico-vaginal wall was found to be intact. No bleeding occurred as a result of the examination.

On April 12, M. Terrier reopened the bladder through the mesial scar. A lobular mass of tumor tissue immediately presented in the wound; it was grasped with suitable forceps, removed piecemeal either with the fingers or with instruments. Its structure was less firm than before and was quite friable. The neoplasm sprang from the left wall of the bladder and extended quite to the summit of the organ; the infiltrated area of the bladder wall appeared translucent and gelatinous, although it was really quite firm.

The tumor was soft, rounded, and grayish; on section, grayish fibres could be seen, including a few rounded masses such as are frequently seen in uterine fibromata. The intermediary tissue was soft, translucent, and œdematous.

For some time after the operation little of note occurred in the condition of the patient, but the track of the drainage-tube refused to close in spite of all efforts at stimulation. During the latter part of July the fistula enlarged, its edges ulcerated, and at the bottom could be seen the ulcerated surface of the tumor site. Cachexia without fever progressively developed. The area of ulceration became as large as the palm of the hand; the edges were red and inflamed; an offensive odor developed; the underlying tumor became greenish-yellow and in part necrotic. Encircling the area of ulceration was a wide erythematous zone, which extended as far as the thighs. Palpation showed that the tumor had recurred and already reached nearly to the navel. There was no glandular enlargement, no œdema of the extremities, no fever. She finally died July 21, 1892.

The autopsy showed that the lower part of the abdomen was nearly filled with a lobulated tumor mass, reaching nearly to the navel. There were few adhesions between the tumor and the omentum or the intestines. The small diverticulum at the summit of the mass contained some sero-purulent liquid. About the little pedunculated mass there were some slight evidences of inflammation, but, with this exception, the peritoneal cavity was quite normal. A sound passed downward through the ureter passed through the lateral mass of the tumor. Several smaller lobes existed on each side, and these, less affected by the extensive necrosis and ulceration than the main mass of the tumor, showed the typical appearances of myomata.

All that portion of the bladder wall lying in apposition to the vagina was healthy, and the posterior wall was not affected. The growth involved chiefly the summit of the bladder, and was about the size of a new-born child's head. The three pedunculated masses at the left and the one on the cephalic aspect of the tumor varied in size from that of a large walnut to that of a mandarine orange.

The kidneys were of normal size, and although on cross section they were somewhat pale, there were no miliary abscesses. There was no dilatation of either ureter. There was nothing noteworthy in the genital apparatus. The liver showed a slight enlargement and a slight degree of the so-called "nutmeg" condition. The heart and also the aorta were slightly atheromatous.

The microscope showed the tumor to be a pure myoma, with areas of inflammatory changes in the strata immediately underlying the ulcerated portion, but nowhere were there any secondary epithelial degenerative changes.

The case reported by Dr. Gerard Marchand is as follows: A man, aged twenty-six years, entered the hospital Laennec April 13, 1892.

In the month of March, 1891, he had commenced to feel pains in the hypogastric region; these were especially marked during defecation. At first indefinite in character, they became gradually more frequent, and finally attended every sort of bodily effort or fatigue. They were never very severe. Urination was retarded,

quite an effort being necessary in order to start the flow; the stream of urine was deformed; he had never noticed pus or blood in the water.

In April, 1893, he noticed blood in the urine for the first time, occurring after an unusual exertion. This hæmaturia lasted for some days, and was the occasion of his entering the hospital.

At the time of his admission he was free from distress, provided he lay quietly upon the back. Any effort or movement or pressure upon the hypogastric region caused pain, and this was especially severe if the bladder was not emptied at frequent intervals. The urine contained blood in solution, and free blood appeared with the first drops of urine at each micturition. Urination frequent; about a litre was passed in twenty-four hours, markedly red in color, and containing numerous small blood-clots, which passed almost without pain and without great effort.

He was pale and emaciated, and his strength had failed rapidly in the last month, although his appetite remained fairly good. He had a rather severe and frequent cough, and expectorated considerable muco-purulent material, in which no tubercle bacilli could be found. Roughened breathing was found over both apices and high-pitched, prolonged expiration.

A diagnosis of vesical neoplasm combined with tuberculosis of the bladder was made.

During the next few weeks medicinal treatment (benzoate of soda, turpentine, and creosote) was faithfully tried, but with little effect. On the contrary, the man became more and more emaciated, and several attacks of retention of urine occurred, which made catheterization necessary; occasionally the aspirator was used. The intravesical bleeding increased in frequency and in amount, and finally on May 3 a hypogastric section was done.

After the usual preliminaries the bladder was opened, and in its cavity a pedunculated tumor was found projecting from the left wall. This pedicle was but half a centimetre in diameter, and a silk ligature was easily passed around it and tightened; the tumor was thus easily

separated and removed from the bladder. The bladder contained shreds of false membrane, blood-clots, and *débris* greatly resembling the contents of a tuberculous abscess. After the cavity had been well irrigated with boric acid, careful examination was made of the bladder wall, but no area of erosion or ulceration was discovered. Upon the side of the tumor mass, however, there was a small area where the substance had begun to break down, and from this place the blood and inflammatory products had originated.

Some slight inability to empty the bladder persisted until early in June, but was ultimately regained. By that time the patient appeared like a different person; his general condition was greatly improved, his appetite had returned, and his weight had markedly increased. The cough persisted, but numerous examinations failed to demonstrate the presence of tubercle bacilli.

Microscopic examination of the tumor proved it to be a pure myoma.

Six months later the man died, after an illness of several weeks, with all the symptoms of a general paralysis. The exact cause of death was uncertain. The bladder was examined and, aside from a slight scar on its wall, appeared to be quite normal. There was no evidence of a recurrence of the tumor.

To these two hitherto unpublished cases the authors add from the literature abstracts of fourteen other cases, reported respectively by Faye, 1871; Socin, 1874; Gussenbauer, 1875; Volkmann, 1876; Belfield, 1881; Belfield, 1881; Eve, 1885; Tassi, 1886; Polaillon and Le Grand, 1888; Gibbons and Parker, 1888; Nicolich, 1889; Nicolich, 1889; Naumann, 1890, and Pilliet and DuPuy, 1892.

As a result of a careful study of the cases, they have arrived at the following conclusions:

Etiology.—The etiology of myomata of the bladder is as yet undetermined. Of the fifteen cases in which the clinical details were given there were seven women and eight men. The age varied from twelve to seventy-four.

Pathologic Anatomy.—Vesical myomata are in many respects

analogous to uterine fibro-myomata. Under the name of myomata those tumors only are included which arise from the muscular tunic of the bladder, and which present the peculiar structure of myomata composed of non-striated muscular fibres. Tumors in which striated muscular fibres were found are omitted; such growths are heterologous formations, striated muscle fibres not being found in the normal bladder. Certain epithelial tumors in which, instead of a stroma of connective tissue, the intercellular structure is made up of unstriped muscle cells, are also omitted; these myo-epitheliomata are really a variety of cancer.

Like the uterine fibro-myomata, vesical myomata take their origin in the muscular layers of the organ. In the process of their development they are prone to project upon either the external or the internal surface of the bladder. Those projecting into the cavity of the bladder are the most frequent. In the sixteen cases reported this was the case in ten instances; in four cases the growth was external; in one case, a diffuse infiltration; in one case growth occurred in both directions.

According as they develop beneath the peritoneum or beneath the connective tissue of the pelvis they tend to become pedunculated in the peritoneal cavity, or to develop in the cellular tissue, just as do the so-called intraligamentous uterine growths.

The segment of the bladder which they occupy is most variable; six times they were in the region of the trigone; three times in the anterior wall; two were at the summit; one in the posterior wall and trigone; one case included nearly all the bladder wall except the right side; one was a multiple tumor, and invaded both the anterior and the posterior walls.

Their volume also varied; from that of a small nut to the size of a child's head (Terrier), and even to the enormous size in the case of Polaillon, where the weight was 3200 grammes.

The general form is rounded and more or less lobulated. They are apt to be pedunculated, but may be sessile or even infiltrative; in the first instance they are easily removed, as they are apt to be encapsulated.

The consistence is, as a rule, firm; occasionally there may be more or less calcification; rarely some tendency to villous growth. There is a tendency to break down and to form ulcers, or to become gangrenous. In two cases there was an epitheliomatous degeneration upon the surface of the growth.

Corresponding with the growth of the myoma there are apt to develop changes in the wall of the bladder as a whole, chronic cystitis, hypertrophy of the walls, and later there may develop an ascending inflammation of the ureters, leading to hydronephrosis (Eve, Dupuy, and Pilliet) or to pyonephrosis (Nicolich).

Histologically the structure is oftentimes a pure myoma; the description of the case of Terrier and Hartmann by Lieffring is typical of this structure. "The tumor is composed exclusively of non-striated muscle fibres, arranged in concentric masses or in bundles, with the fibres crossing in all directions. Between the bundles of fibres there is a very small quantity of connective tissue. The mucosa which covers the tumor mass is, for the most part, inflamed and deeply congested. Beneath a stratified epithelium whose cells are proliferating, and are smaller than normal, there is found a sub-epithelial layer, very vascular and thick, and composed of an accumulation of embryonal cells; then, without any sharp line of demarcation, comes the main neoplastic mass composed of muscle fibres, easily recognized by their elongated fusiform shape, and their greatly elongated nucleus, oblong, and rounded at the ends. These fibres are arranged either in sheaves or in whorls." Sarcomatous or epitheliomatous degeneration may occur in addition to the inflammatory and gangrenous changes which are often present at some portion of the tumor.

Clinical History.—The symptoms vary according to the direction of the growth. In the first instance there may be no bladder symptoms at all, or, at least, only those which would be caused by the pressure of an uterine tumor; there is no hæmaturia and no cystitis. In rare cases (Eve) the site of the growth was such as to compress the ureter and so lead to hydronephrosis. In the case

of Faye dystochia was caused by the tumor which narrowed the pelvic diameter. Polaillon's case gave no bladder symptoms, and even after the tumor was removed it was still believed to be an ordinary fibroma of the uterus. In such cases it is evident that the diagnosis is very difficult.

Where the cavity of the bladder is invaded the diagnosis is greatly simplified; in short, the symptoms are those of any form of tumor of the bladder combined with the physical signs upon examination suggestive of a fibro-myoma of the uterus. Hæmaturia is one of the most frequent symptoms; this is usually intermittent, but may become continuous and lead to an acute anæmia, and frequent attacks of syncope. Blood-clots may cause retention of urine. The hæmaturia is often accompanied with other symptoms referable to the urinary tract; frequent, painful, and sometimes difficult micturition; some complain of great heaviness or discomfort in the perineal or hypogastric regions. When cystitis occurs as a complication the urine shows the characteristic changes of this condition.

Intravesical exploration does not always give any great help to reach a correct diagnosis. Hypogastric, vaginal, and rectal palpation, and especially bimanual examination, are much more satisfactory, and in most instances the site and size of the neoplasm can thus be determined.

The duration of the disease is variable. Death occurs often as a result of ascending inflammatory and infectious changes; often as a result of operative interference.

Treatment.—The treatment evidently should vary according as the growth is external or internal.

In the external variety of vesical myomata the usual rules of abdominal surgery will apply. In the case of Polaillon great difficulty was experienced in finding and in opening the peritoneal cavity, as the growth had occurred along the connective-tissue spaces underlying the abdominal muscles; the prevesical space was obliterated, and the new growth extended so far up the abdominal wall that the incision was prolonged four fingers' breadth above the umbilicus before the

normal peritoneal cavity was reached. The tumor itself was drawn out as far as possible, transfixed, ligated, and removed, just as is done in an abdominal hysterectomy, where the pedicle is treated externally.

It seems probable that, as these myomata are habitually encapsulated, it would be best to enucleate them, extirpate the pedicle, and close by suture the wound of the bladder wall which would follow such ablation.

In those myomata that encroach upon the cavity of the bladder, the surgeon will be guided by the rules habitually followed in the removal of vesical tumors in general. Perineal section, vaginal section, and hypogastric section, or combinations of these, have each their advocates; at the present time, however, the advantages of hypogastric section, as shown by Professor Guyon, are especially marked in the removal of this form of tumor.

The question of hæmostasis has occupied the attention of many surgeons. The écraseur and the wire loop of the galvano-cautery have been used to prevent loss of blood. These precautions are unnecessary; uterine fibro-myomata as well as vesical myomata often bleed freely, but, on the other hand, when they are attacked at their centre, hæmorrhage is slight.

In case the tumor is a small one, it should be drawn into the hypogastric wound by means of forceps; if any large vessels are found, passing into its base, they should be ligated, and the wound in bladder wall, caused by the removal of the tumor, should be sutured.

If the tumor is very large, the removal of too large a part of the bladder wall can be avoided by removing the tumor piecemeal, by beginning at its centre and working towards its periphery.

After the tumor has been removed, drainage of the bladder should be secured by the use of a hypogastric siphon-tube in the male, and an abdomino-urethral drain in the female.

H. P. DE FOREST.

VON BÜNGNER ON THE HEALING IN OF FOREIGN BODIES UNDER THE INFLUENCE OF CHEMICAL AND MICROPARASITIC IRRITATION.[1]

VON BÜNGNER, of Marburg, has made a series of experiments in order to bring nearer to its solution the question of inflammatory and healing processes under the influence of chemical and microparasitic irritations.

As foreign bodies he used principally small bits of sea-sponge, also small bits of human lung hardened in alcohol, and injected with blue gelatin. As chemical irritants he employed turpentine and iodoform; and as microparasitic irritants, staphylococci pyogenes aurei. Capsules containing iodoform and staphylococci were introduced into the peritoneal cavity of guinea-pigs. The duration of the experiments varied from seven hours to seven days. In all there were some forty-two experiments made.

I. *Experiments with Sponge soaked in Turpentine.*—Macroscopically the piece of sponge in the abdomen was found surrounded by a grayish-white capsule in from sixteen to twenty-four hours, fixing it to the peritoneum. In its immediate vicinity was a moderate degree of congestion, otherwise there were no changes.

Microscopically the piece of sponge was found encapsulated in numerous layers of fibrin, the holes in the sponge were filled with fibrin, which was especially richly developed near the circumference, and the meshes of which were strewn with small round cells.

The most noticeable things were the dark turpentine masses scattered throughout the foreign body, and the thick infiltration of the outer part of the same. This last condition is due to the fact that the turpentine as a fluid medium very rapidly diffuses into surrounding parts and fills the entire foreign body, and for this reason it forms at the border of the same a protecting zone of demarcation. From the peripheral infiltration the round cells press inward, especially

[1] Verhandlungen der deutschen Gesellschaft für Chirurgie, XXIV Kongress, 1895.

where the collections of turpentine are found, towards the inner part of the foreign body, surrounding the turpentine. For this reason there is a zone free from cells between the ring of infiltration and the central dark turpentine collection. By means of this broad zone of demarcation at the border of the foreign body, and by means of the ring of infiltration within, the irritating material is isolated, and is thus early prevented from acting upon the general organism.

The peritoneum lying near the turpentine sponge looked swollen and injected, the connective-tissue fibres separated asunder from one another, the endothelial cells broken loose from their places and shoved into the neighboring fibrin layers.

The distended vessels of the surrounding tissue contained many leucocytes hugging the walls of the vessels and in process of emigration towards the foreign body. In the tissue itself were found many exudation cells. These possessed either numerous, small, sharply-stained nuclei or a simple, large, clearly-stained nucleus, containing numerous vacuoles. The peripheral layer of its protoplasm could be seen as a clear capsule.

Within the foreign body most of the exudate cells were more or less degenerated, and presented cells in various states, from those which were intact and perfect to those which were in the last stage of disintegration. Between these were all varieties of intermediary stages. The destruction of the cells became more marked as the turpentine deposits were approached, and when the immediate neighborhood of the same was reached most of the cells were of a pale-gray color, with stainless nuclei, bestrewn with vacuoles and shrunken.

After two days the turpentine formed no more islands, but the exudate cells pressed in still greater masses towards the inside of the foreign body, and at the same time the fibrin penetrated farther towards the middle of the foreign body.

At this time the first signs of reparative action are manifested in the fixed connective-tissue cells and in the endothelial cells of the tissue. The nuclei show the different phases of nuclear division; the protoplasm becomes swollen at the periphery, and by the division of

the same numerous new cells are formed. A part of these are spindle-shaped or stellate, with very fine fibrils running through them and into the pre-existing connective tissue; another part is characterized by very large polyhedral, or irregularly rounded, sharply-outlined bodies of protoplasm, which do not contain the fine mesh of fibrils, but which are granular instead, and are in close relation with the proliferating endothelial cells. Büngner claims, therefore, that the endothelial cells, whose important relation to the formation of tumors has been recognized more and more in recent times, play a much more important *rôle* in the process of wound-healing and in the process of inflammatory new formation than has been heretofore supposed.

The rich growth of young cells occurs not only on the surface of the foreign body, but also penetrates into the cortical portion of the same. By the third day the zone of purulent infiltration has advanced considerably towards the centre of the body, so that the periphery presents the appearance of a clear border. This becomes replaced by loose granulation tissue, which follows immediately after the leucocytes, while still farther towards the periphery older and firmer spindle-cell tissue is found.

Exudate cells with large nuclei appear in the foreign body. These contain blackish turpentine drops and also chromatin particles, as are found as products of disintegration in pus. The loosely-united and many-shaped young granulation cells in the clear peripheral zone take up the drops of turpentine and also the broken-down leucocytes.

It is very easy to differentiate the descendants of the tissue cells from the exudate cells. The question as to whether the exudate cells, as well as the granulation cells and connective-tissue cells, go to make up the new tissue, can be emphatically denied. On the other hand, the granulation cells take no part in the formation of the purulent, inflammatory exudate.

By the fourth day the leucocytes, containing remains of the turpentine and particles of chromatin, have travelled still farther towards the centre. On the periphery the formation of permanent tissue has continued to progress.

The further development of the young granulation tissue from the fifth to the seventh day goes on in such a manner that the foreign body becomes gradually enclosed in a layer of spindle-cell granulation tissue; and from its periphery it becomes permeated by firm granulation tissue, which, without any sharp dividing line, merges into the neighboring tissue, on the one hand, and into the young, loose granulation tissue within, on the other. In a sponge experiment, on the seventh day, the cavities of the foreign body were completely filled, and young, vascular granulation tissue had penetrated to the very interior. These cells contained but few particles of disintegrated cells. Among these cells were delicate fibres, representing the first analogue of intercellular fibrillar tissue.

A further development is the formation of new capillaries, which can be observed as early as the second day. On the second day also begins the development of multinuclear giant-cells at the place where the foreign body is adherent. By the fourth day numerous giant-cells are present, some of which are laden with blackish drops, and by the seventh day they have permeated all of the granulation tissue. Many of these contain sixty or eighty, or, indeed, as many as a hundred nuclei. Their protoplasm is either of an homogeneous or finely granular character, like the protoplasm of the endothelial cells. It is often finely striped like that of the connective-tissue cells.

According to Von Büngner's observations of the formation of giant-cells, the granulation cells, and especially the descendants of the endothelial cells, play the chief *rôle* in their development. The increase of nuclei comes about in all probability through karyomitosis so long as the cells continue to develop; when the cell reaches its full development the nuclei increase by fragmentation.

In the turpentine-lung preparations, the appearances of the suppurative inflammation and the tissue new formation are practically the same as in the experiments with bits of sponge soaked in turpentine. The new cells can be followed in their course through the interstices in the foreign body. There, too, are the large nucleated exudate cells

recognized as the most vital and active elements which take up the coloring matter. The exudate cells containing small nuclei were found to be inactive in taking up this foreign material. The granulation cells and giant-cells were also found to contain blue pigment matter in the form of granules lodged in the protoplasm of the cell.

II. *Iodoform Experiments.*—The macroscopic and microscopic appearance of the foreign bodies impregnated with iodoform resembled in many respects those treated with turpentine. The round-cell infiltration was here, too, very evident both in the environment and within the substance of the body. There was no cortical infiltration, but within the first twenty-four hours the exudate cells had appeared over the whole mass and had penetrated in irregular groups into the very centre of the body. This is explained by the fact that the iodoform provokes an active chemotactic and inflammation-producing change. Another difference between the turpentine and iodoform experiments lies in the fact that the exudate cells did not encroach upon the turpentine during the first few days, while with the iodoform they came in direct contact with the crystals and completely surrounded them.

Most of the exudate cells soon after penetrating the foreign body underwent degeneration ; though in the experiments with turpentine a disintegration of the nuclei of the leucocytes into granular masses did not take place. After the second day the exudate cells of both forms present a grayish coloration, and by the fourth day they have fallen into a state of fatty degeneration.

The appearances of organization are the same as in the turpentine experiments. Especially in the iodoform preparations did there appear in the vicinity of the new connective-tissue multinuclear giant-cells, which in size and in the number of nuclei were not much inferior to those in the turpentine preparations, a considerable portion of the young granulation cells and the multinuclear protoplasmic masses, like the exudate cells, with numerous grayish-black nuclei and flecks.

Leucocytic phagocytes were frequently observed ; but tissue-cell phagocytes were never seen in the iodoform experiments. This observation is in harmony with the very small tendency of the nuclei to degeneration.

From the whole series of observations one gets the impression that the granulation tissue develops first where the iodoform has been removed, and that so long as iodoform remains in the foreign body no organization takes place. Still, the usefulness of iodoform in the healing process in the presence of sterile foreign bodies, as was the case here, is very problematical. Von Büngner regards it as a mistake to employ iodoform in entirely aseptic operations. In the peritoneal cavity iodoform is much used without any real indications, and is the cause of numerous untoward developments, such as the formation of adhesions and bands, because of its great power to cause inflammatory changes with the formation of fibro-purulent exudation. Of course, the use of iodoform, as is so universally practised in the presence of microparasites, does not come into the question here.

III. *Staphylococcus Experiments.*—Concerning the macroscopic appearances of foreign bodies treated with staphylococci, it is to be remarked that they were found covered with a grayish-yellow, fibro-purulent coat, which quickly fixed them to the surrounding tissue. Often there was observed an adhesion to loose particles, which became firmer as time passed. After a few days, a circumscribed fibro-purulent peritonitis, which tended to become shut off by adhesions, developed about the foreign body.

Microscopically, it was observed that there was a marked migration of cells into the tissues as early as seven hours after the implantation. This infiltration with round cells was similar to that in the turpentine experiments, with the exception that the demarking peripheral zone was absent. The number of staphylococci in the foreign body was very considerable, some of which were found free and some inclosed in the exudate cells. The connective-tissue cells and epithelial cells of the neighboring tissue were swollen, contained vacuoles, and were in a state of degeneration.

The first signs of proliferation were observed on the first day in the endothelial cells, and on the second day in the connective-tissue cells of the neighboring tissue. A considerable part of the large nuclear exudate cells in the extreme periphery of zone of cocci were found laden with nuclei and staphylococci. The degeneration of nuclei in these staphylococcus experiments was very pronounced. The purulent inflammation is characterized in that the exudative cells very quickly perish; so that at the same time, it may be said, that a more intensive suppuration is caused than by the action of iodoform.

The features of the new tissue-formation in the succeeding days correspond with that already described. The giant-cells appear in somewhat larger numbers. It is observed that the connective-tissue and endothelial cells (especially in those places where there are few cocci) constantly grow in the periphery of the foreign body.

The formation of vessels and giant-cells begins on the third day. The giant-cells appear in larger numbers, but rather late, and only in those places where connective tissue has grown into the foreign body.

The number of staphylococci, which were found chiefly in the middle portion of the foreign body where the exudate cells were most numerous, is so large up until the fifth day that a constant reproduction must take place to replace those consumed by the exudate cells. The granulation tissue (the abscess membrane) forms a strong protection against the further extension of the infection.

In many places pus-cells, as well as pus cocci, in large numbers were found taken up by the connective-tissue and endothelial cells. The nuclei of the granulation cells lying near the centre and which contain many cocci, gradually perish, while the older granulation cells lying farther from the centre, and containing fewer cocci, remain alive while the contained cocci die.

JAMES P. WARBASSE.

INDEX TO SURGICAL PROGRESS.

GENERAL SURGERY.

I. Some Statistics on Narcotization. By PROFESSOR GURLT (Berlin). Seventy-seven reports from clinics using anæsthetics during the past year give a sum total of 52,677 narcoses. Of these there were with chloroform, 31,083; with ether, 15,712; with chloroform and ether, 2148; with Billroth's chloroform-ether-alcohol mixture, 1554; with bromethyl, 1426; and with pental, 34. Among the cases in which chloroform was used occurred twenty-three deaths, unquestionably due to that drug, and eight deaths of doubtful cause. Among the etherized cases occurred five deaths and one doubtful case. No deaths occurred with the Billroth mixture.

The statistics for five years show one death to every 2909 chloroform narcoses, one to every 6004 ether narcoses, one to 10,162 with ether and chloroform, and one to 5745 with Billroth's mixture. Thus it is seen that the ether statistics are better than those of chloroform. But ether narcosis is often followed by pneumonia, and out of thirty such cases there were fifteen deaths. Thirteen of these occurred after abdominal operations. The reason for this, is that after abdominal operations, the pain causes suppression of coughing. For this reason ether narcosis is to be avoided in abdominal operations.

The chairman of the German Surgical Congress has requested each member to forward the statistics of his anæsthetizations for the year 1896. It is requested to observe especially the following points:

(1) Period of observation.

(2) Anæsthetic or mixture used, and in how many cases.

(3) Source of supply of the same.

(4) Apparatus used.

(5) The length of time in unusually long anæsthetizations (one hour and over).

(6) The amount of anæsthetic used per minute, or the average for each narcosis, or the maximum amount in protracted narcoses.

(7) Drugs, such as morphine and other injections used at the same time, and in what amounts.

(8) In how many cases was the urine examined before the anæsthetization, and sugar or albumen found; the method used; and the percentage of sugar when present.

(9) Accidents during and after the anæsthetization: (*a*) Asphyxia (treatment, tracheotomy, etc.); (*b*) deaths (cause, findings at autopsy, etc.); (*c*) untoward after-effects of chloroform and ether (late collapse, pulmonary œdema, bronchitis, pneumonia with or without fatal outcome).—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXIV Kongress, 1895.

II. Cocainization of the Nares as an Adjunct to General Narcosis. By P. ROSENBERG (Berlin). As a conclusion to a double series of animal experiments, Rosenberg claims that cocaine is an antidote to chloroform.

The first series of experiments, in which the animal was given cocaine after deep narcosis had been established, showed the interesting result that cocaine had the power of instantly checking the action of chloroform upon the brain.

In the second series of experiments, in which the animals were given cocaine before and during the narcosis, it was shown that cocainized animals could stand double the amount of chloroform, and could be kept anæsthetized for a much longer time than the control animals.

According to these observations cocaine is of much value in narcosis. Its chief value lies in the fact that with a very small amount of cocaine the whole mucous membrane of the nose, and therewith the nasal endings of the trigeminal nerve filaments, can be anæsthetized. The paralysis of the trigeminus is of inestimable value in

general anæsthesia, for the reason that the untoward action of chloroform in producing cardiac syncope is a reflex action upon the heart through these nerves. For this reason the use of cocaine in the nose before general anæsthetization is a precaution of great value.

When we consider the advantages of the cocaine-chloroform combination and the absolute safety of the very small amount of cocaine required, every physician should, not only for his own interest, but for that also of his patient, combine these two agents. The action of cocaine in this way can be used to lessen the danger of ether as well as chloroform.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXIV Kongress, 1895.

III. The Etiology and Histogenesis of Carcinoma. By PROFESSOR H. TILLMANNS (Leipzig). As the knowledge of the etiology and histogenesis of carcinoma has developed, so has the treatment of the disease been placed upon a firmer scientific basis, and the percentage of cures been increased. Of the recent contributions to the literature of this subject that of Tillmanns is noteworthy. He accepts the Thiersch-Waldeyer hypothesis. Carcinoma is a new growth originating in the pre-existing superficial and glandular epithelium, disturbing the normal tissue arrangement at the seat of origin, presenting an unconfined peripheral growth, and by proliferation through the lymphatic channels, more rarely through the blood-vessels, going on to a general intoxication and death of the patient. The epithelial carcinoma-cells lie like parenchyma-cells in a stroma of connective tissue of irritative or inflammatory origin. Both the stroma and epithelial cells are lawlessly intermingled. Not every atypical epithelial growth can be regarded as carcinoma, but only such as grow irregularly, diffusely, without encapsulation, and which become detached from the mother cells and cause metastases. But from atypical epithelial growths which are originally non-malignant, carcinoma may develop, as, for example, when mechanical or chemical irritation is present.

There are a number of very adequate hypotheses for the origin

of tumors and carcinoma. The hypothesis of Cohnheim, claiming that tumors arise from dislodged embryonal cells, cannot be accepted as an universal law, but it offers the best explanation of the origin of a large number of tumors, as, for example, rhabdomyoma, dermoid cysts, the tumors arising from dislocated cells of the suprarenal capsule and from accessory thyroids, branchiogenous carcinoma, and hetereogenous growths. The hypothesis of Ribbert is the most recent. According to Ribbert carcinoma does not begin in a penetration of the epithelial cells into the connective tissue, but in an active growth of the subepithelial connective tissue. By virtue of this subepithelial growth the epithelial cells are tilted out of their normal relations and surrounded by connective tissue. There they grow in the direction of the least resistance,—namely, in the connective-tissue spaces and the lymphatic channels. Tillmanns accepts in part the discoveries of Ribbert as accounting for the origin of carcinoma, but he claims that often in cases of carcinomatous degeneration the subepithelial connective tissue remains entirely passive. Hauser claims that the formation of metastases is not always necessary in carcinoma. The beginning of the tissue-changes depends upon whether the *causa morbi* acts upon the connective tissue or the epithelium. Wherever the changes begin, the nature of carcinoma depends upon a fundamental change in the biological character of the epithelial cells; so that, according to Hauser, the cells possess the character of parasites, as it were. A differentiation from their normal type, or anaplasy (Hansemann), takes place. Tillmanns believes that these differentiated cells possess no outward signs by which they can be distinguished from the original normal cells.

The attempts to prove the bacterial origin of carcinoma have been entirely futile.

The question of the parasitic origin of carcinoma has attracted much attention. According to Tillmanns the presence of sporozoa in carcinoma has not yet been proven.

The transplantation of carcinoma has been observed. But this has only been accomplished by autoinfection or by infection of the

same species of animal,—that is, from man to man, or from one animal to another of the same species, as the dog, mouse, or rat. The transplantation of carcinoma from one species of animal to another, as from man to a lower animal, has never been successfully accomplished. The predisposition of carcinomatous subjects to receive transplanted carcinoma is very great. Still, carcinoma cannot be regarded as a contagious disease in the ordinary sense. The spread of carcinoma by contagion is possible, as, for example, the carcinoma of the penis being found associated with the carcinoma of the uterus of the consort, but this is an occurrence of the greatest rarity. The transplantation and contagion of carcinoma does not argue for the contagiousness or parasitic nature of the disease, but only points to a successful transplantation of tissue. New methods of investigation must be invented if the parasitic origin of carcinoma would be discovered.

Tillmanns calls attention to peculiarities of carcinomatous metastases. Of especial interest are the frequency of metastases in bone in cases of carcinoma of the thyroid gland, also in carcinoma of the breast, testicle, and prostate; and also the rarity of carcinomatous metastases in the spleen. The changes in the blood in cases of carcinoma are practically the same as in fever.

Of the predisposing causes of carcinoma must be mentioned, first of all, the influence of long-continued mechanical or chemical irritation, especially in advanced years. The influence of chronic inflammatory irritations is seen in the skin, lip, tongue, uterus, and mamma, and especially the pathological action of tobacco and brandy upon the tongue, throat, and œsophagus. In the etiology of carcinoma of the gall-bladder, gall-stones play an important part. Tillmanns continues by calling attention to the various well-known exciting causes of carcinoma; and concludes by referring to the importance of scars, benign growths, heredity, sex, race, and the nourishment. He calls attention to the statistics of Williams, showing the increase of the percentage of deaths from this disease, especially in Europe and America. In England, according to Williams,

the death-rate from carcinoma is four times greater than it was fifty years ago.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXIV Kongress, 1895.

IV. Successful Transplantation of Carcinoma in Dogs. By Dr. Geissler. In following up the experiments of Adamkiewicz Geissler found that the transplantation of carcinoma from one animal to another could only be successfully accomplished when the same species of animal was used. When Adamkiewicz transplanted carcinoma from man into the brains of rabbits, and thereby caused the death of the animal, what he observed was not a growth of carcinoma-cells, but the phenomena of sepsis. A repetition of his experiments should demonstrate to him that small bits of carcinoma from man can be made to become fixed in the brains of rabbits without reaction, just as can be done with any other foreign tissue which is free from micro-organisms.

Such tissue does not go on and grow and form carcinoma when the transplanted tissue has been taken from some other sort of animal different from that into which it is transplanted. Indeed, transplantation within the same species is uncertain in its results. These facts have been positively demonstrated in dogs by Novinsky and Wehr, and in rats by Hanau. Geissler has also made a number of such transplantation experiments.

He operated aseptically, using freshly excised canine tumors which had been kept for two or three hours in warm normal salt solution. From these he took bits the size of a lentil seed and introduced them by means of a trocar into the subcutaneous and deep scrotal tissue. The superficial wound he sealed with some photoxyllin. In only two cases was he able to observe any growth. These belonged to the class of tumors which cause the cauliflower-like growths of the prepuce.

In one case, which was thus operated upon in the middle line of the abdomen, after implanting similar bits beneath the skin of each flank, the tumors grew to the size of a plum in the course of three

weeks, and then gradually atrophied away. Section of this tumor showed the structure of spontaneous carcinoma. In the course of two months these nodules had entirely disappeared.

In the case of another dog, he planted preputial carcinoma in each flank beneath the skin and in the deep tissue of the scrotum. In the course of eight weeks a very noticeable tumor had grown in each of the three places. The one in the left side of the abdominal wall finally ulcerated, and the dog gradually failed and died in the course of eight months.

In the case of a much-emaciated poodle dog he found in the skin of the thorax on either side some six or more nodules, varying in size from that of a lentil seed to that of a pea. Some of these were adherent to the skin, and some were freely movable under the skin. In the linea alba, just at the border of the xiphoid cartilage, were two ulcerations of a dirty-yellow color with densely infiltrated bases. One of these ulcers was six and a half centimetres, the other two and a half centimetres long.

On the left testicle, which seemed enlarged, could be discerned the point of puncture which had pierced the albuginea. A nodule the size of a pea had developed in the overlying skin. It was freely movable in the underlying tissue, and had not ulcerated.

On the left side of the prepuce was a hard tumor seven and a half centimetres by three and a half centimetres. It was adherent to the skin. The lymphatics in the groins were enlarged; and in the skin on the inner sides of the thighs were small metastatic deposits.

On opening the abdomen the left spermatic cord was found thickened, and bearing a nodule the size of a cherry pit, which had compressed the ureter and caused a cystic degeneration of the kidney. On taking out the intestine numerous isolated nodules of the mesentery and omentum were found, which were adherent to the peritoneum of the posterior abdominal wall. The spleen was enlarged and strewn with so many nodules the size of cherry pits that the spleen tissue could hardly be discovered between them. Small nodules were also found in the serosa of the stomach, and on the lateral peritoneal

reflections of the bladder. The liver, especially on its upper side, was dotted with yellow spots, which did not project above the surface, but which could be made out as firm nodules in the liver substance.

In the thoracic cavity a ragged deposit was found upon the parietal pleura, and some upon the pulmonary pleura. The pericardium was unchanged.

The lymphatics were enlarged, especially the lower glands of the neck, which were enlarged to the size of plums. Somewhat less, but still just as characteristic, were the changes in the glands of the lower leg and groins.

The microscopical examination of these tumors showed their identity with spontaneous carcinoma. This canine tumor is not just the same as the carcinoma of man. An alveolar structure encloses polymorphous flat cells, which are in some places closely packed together, especially in the principal zone of the alveoli, and in some places loosely filling the middle of the same.

And to show that the growth originated from the implanted piece, the experimenter implanted a bit of tumor from this dog into a second dog. After four weeks a nodule the size of a pea was found on one side. This continued to grow, and at the end of twelve weeks had reached the size of a plum; while on the other side a small nodule the size of a pea was just beginning to appear. — *Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXIV Kongress, 1895.

BONES AND JOINTS.

I. Acute Osteomyelitis. By Dr. Funke (Prag). Funke has studied some 664 cases of osteomyelitis in the surgical clinic in Prag. Some of these were observed in the acute stage, some in the stage of necrosis.

Fifty-six cases occurred in patients over twenty-five years of age, of which eight occurred in the fifth decennium, three in the sixth decennium. Traumatism and cold were attributed as the most fre-

weeks, and then gradually atrophied away. Section of this tumor showed the structure of spontaneous carcinoma. In the course of two months these nodules had entirely disappeared.

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quent and important causes. The cases of recurrent osteomyelitis were few.

In the eight cases of osteomyelitis recidiva the process had ceased after spontaneous casting off of the sequestrum, or after its operative removal; and then, after the diseased part had become healed, in later years a new process of disease developed in the same bone.

Concerning the question as to whether, in case of osteomyelitis recidiva, a new infection occurs, or whether latent germs of the old infection persisted, Funke brings to bear four cases in which the osteomyelitis developed at the site of fractures acquired respectively one, six, sixteen, and twenty-nine years before. This speaks for the new infection with consideration of a certain disposition of the scar tissue to metastatic inflammations.

Multiple osteomyelitis was observed in thirty-seven cases. In four cases were three and four bones involved at the same time, and in one case five different bones were synchronously diseased.

The onset was always acute, localizing itself in most cases in one bone, and then after the lapse of days or weeks, with rise of temperature, though without chill, involving other bones.

Out of the comparatively large number of cases of multiple osteomyelitis which invariably involved young individuals, and from the fact that the disease rarely attacks fully-developed bones, Funke has evolved the conclusion that in young persons acute osteomyelitis possesses especial disposition to the formation of metastases in bone. In very young children metastases can occur in the internal organs.

The same author has reported a case of ostitis et periostitis albuminosa in a thirteen-year-old boy, and also three cases of osteomyelitis following typhoid.— *Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXIV Kongress, 1895.

JAMES P. WARBASSE (Brooklyn).

II. Cases of Ambulant Treatment of Fractures of the Lower Extremities treated at the Serafimer Hospital. By DR. F. BAUER (Stockholm). The author reports to the Swedish

Medical Society his experience in ten cases. The cases are: Three fractures of both malleoli, of which one was compound (Nos. IV, V, II); one, Dupuytren's fracture (No. III); one, fracture at the upper and middle third of tibia (No. VII); one, complicated fracture at the middle of tibia (No. VIII); one, fracture at the middle of tibia and upper third of fibula (No. VI); one, fracture of patella (No. I); one, fracture above the condyles of femur (No. X), and one case of pes valgus, where osteotomy was performed on tibia and fibula (No. IX).

The method used has been that practised by Krause and Albers. In the first two cases he did not use the method exclusively, but when he found that no untoward results in the healing process and that no complications occurred, he applied the plaster-of-Paris bandage the first few days after the injury, and in two cases immediately after the fracture was received, before swelling had started.

He noticed in both these cases, in one of which (No. VIII) there was marked deformity complicated by a wound over the fracture, much less swelling than is usual. The explanation of this he presumes to be reposition of the fragments soon after the injury and the close-fitting bandage acting by its compression prevents effusion of blood.

In no case was it necessary to remove the bandage on account of pain or pressure. In nearly every case the patient left the bed the day after he put on the bandage, and then continued moving about, at first with the aid of crutches, then with a cane, or with no extra support at all. The stiffness of the knee-joint and the atrophy of the muscles soon disappeared under proper treatment. The results obtained in regard to the time for consolidation and restoration of complete function agree closely with those of Krause and Albers. (See ANNALS OF SURGERY, 1895, Vol. XXI, pp. 195 and 201.) In the ankle-joint free motion has been retained in all cases; never any dislocation or interference with the formation of callus.

To these cases presented to the Swedish Medical Society he adds a description of eight additional cases treated since by the ambulant

method: one supracondyloid fracture of femur, one fracture of the leg (Y-fracture), one common fracture of the leg, three supramalleolar fractures of tibia and fibula, two Dupuytren's fractures. In all these cases the treatment was exclusively ambulant, and with the exception of the first case they were of no special interest. The particular case referred to was that of a man, sixty years old, who, while blasting, sustained a supracondyloid intra-articular fracture of the femur.

As the effusion of blood in the joint was considerable, it was punctured and a plaster bandage applied on the seventh day after the injury. This was changed the eleventh day and another put on, which remained until six weeks after the injury, when the callus was found to be firm with shortening of limb one centimetre; motion of joint not very free. Massage, bathing, and gymnastics resulted in a complete cure eight weeks after admission to the hospital.—*Hygeia*, No. III, 1895.

A. G. THORÉN (New York).

III. Isolated Fractures of the Head of the Fibula. By ALEXANDER TRIETZE, M.D. (Breslau). Isolated fractures of the head of the fibula are of rare occurrence. Dumollard, in 1882, collected twelve cases from literature. The author reports a case of this kind in an army officer who had been thrown from a horse. The upper fragment was drawn up about one centimetre and could not be held down in place by splints or apparatus. After the ecchymosis had subsided an incision was made over the fracture and the fragments wired together. He left the hospital after seven weeks perfectly cured.

Fractures of this kind occasionally occur from direct violence, but more often from muscular action. Cases recorded by Hewgott Lotzbeck and others show conclusively that the head of the fibula is pulled off by too violent contraction of the biceps. This may occur when the leg is fixed and does not move when the muscle contracts, or when the leg is extended and the muscle does not relax.

Owing to the proximity of the peroneal nerve that structure is

especially liable to injuries of various kind, either by direct trauma at the time of the injury or by being pressed upon by the callus. The knee-joint is seldom opened, although the tibio-fibular joint sometimes communicates with the knee.

The prognosis is not especially favorable owing to the frequency of injury to the nerve and the difficulty of obtaining good bony union.

The usual treatment is to replace the fragments as well as possible and place the leg in a flexed position until healing occurs. The case reported is the first one in which the fragments have been sutured, although the operation has been strongly recommended by Weir.—*Archiv für klinische Chirurgie*, Band XLIX, Heft 2.

GEORGE R. WHITE (New York).

MALE GENITO-URINARY ORGANS.

The Result after Operations for Hydrocele by Puncture and Injection of Iodine. By DR. SPALINGER (Krönlein's Clinic, Zurich). From 1881 to 1894, seventy cases of hydrocele were treated in Krönlein's clinic in Zurich. In forty-six of the cases the fluid was evacuated by a trocar and two to ten grammes of tincture of iodine were injected and allowed to remain. Considerable pain and swelling of the scrotum followed the injection, but both usually disappeared within a week. The patients were put to bed immediately after the injection and remained there about two weeks on the average. Thirty-five of the patients thus treated were seen subsequently, and five (14.28 per cent.) were suffering from a recurrence. This percentage of recurrence is higher than is reported from other clinics. Two hundred and ninety-nine cases which were examined some time after the operation show an average of 8 per cent. of recurrence. During the same period seventeen operations by incision were done by the methods of Volkmann, Bergmann, or Juillard. The patients were kept in the hospital an average of thirty-eight days, and when discharged half of them had granulating wounds which required treatment. There were no recurrences.

The author believes that injection with iodine should be tried in all cases of hydrocele before recourse is had to a radical operation. As compared with the latter method, injection with iodine is a much less severe procedure, the time of healing is but one-half, and the result is satisfactory in the majority of cases. When recurrences do take place they are usually small and frequently cause no inconvenience. —*Beiträge zur klinische Chirurgie*, Band XIII, Heft 3.

GEORGE R. WHITE (New York).

EXTREMITIES.

Double Amputation of the Leg with Plastic Formation of Feet by Bier's Method. By DR. ALEXANDER RITSCHL (Freiburg). In 1892 Bier described an operation in which he removed a wedge-shaped piece of bone and soft parts from the front of the leg a little above the lower end, in such a manner that the lower fragment could be turned at right angles to the axis of the shaft of the bone, forming a kind of foot.

Bier's cases and one other are all that have been published as yet.

In February, 1894, a patient suffering from the loss of both feet from freezing came into the clinic at Freiburg and was operated upon by Professor Kraske. An ordinary circular amputation was done and the wounds healed. Two months later Bier's operation was performed on both legs in the following manner. Two horizontal incisions were made across the front of the leg. The lower one was convex downward and was placed about three centimetres above the lower end of the stump. The upper incision was convexed in the opposite direction and placed four centimetres higher. At the sides of the leg these two incisions were joined together by vertical incisions, the inner one along the inner margin of the tibia and the outer one along the posterior angle of the fibula. The soft parts included between these incisions were removed down to the bone. A wedge-shaped piece, broadest in front, involving the whole thickness of the bone, was removed, and the sawed surfaces so arranged that when brought into apposition the lower fragment stood at right angles to the shaft

of the bone. The lower fragment was held in place by catgut sutures and a splint was applied to the leg after the dressings were put on. Five months later the patient was provided with boots resembling those used after Pirogoff's operation, and was able to go about very well with the aid of a cane.

The advantages of this operation, as claimed by Bier, are as follows:

(1) The evil from atrophy of the bones and muscles is avoided.

(2) The gait is more steady and constantly improves.

(3) No ulcers form about the head of the tibia,—a frequent cause of annoyance when a prothesis is used.

(4) There is no danger of a conical stump forming.

(5) The expense of the shoes and keeping them in repair is much less than that of a prothesis.—*Beiträge zur klinische Chirurgie*, Band XIII, Heft 2.

GEORGE R. WHITE (New York).

REVIEWS OF BOOKS.

THE PATHOLOGY AND SURGICAL TREATMENT OF TUMORS. By NICHOLAS SENN, M.D. PH.D., LL.D., Professor of Surgery in the Rush Medical College and in the Chicago Polyclinic. Royal 8vo, pp. 709. Philadelphia: W. B. Saunders, 1895.

In 1761 the Italian physician Morgagni published his monumental work, "De Sedibus et Causis Morborum per Anatomen Indagatis." Since that time, and especially during the last quarter of a century, the study of the causes of disease as revealed at the autopsy table and in the laboratory has become more and more important. The study of gross appearances of morbid tissues, which has been pursued for years by the leaders in the "practice of physick," has been supplemented by the results of investigations with the microscope; the technique of hardening tissue and of staining sections has become an art; the uncertain use of the knife, free-hand, has been replaced by the mechanical accuracy of the microtome; the single biconvex lens has developed into the compound microscope; the discovery of bacteria and their relation to pathologic processes; the different culture media; the effects of light and air upon cell growth; the advances in the domain of chemistry, physics, and mechanics; the marvellous improvements in photography, in dry plates, process printing, printing in colors, and in microphotography; all have contributed to the advancement of medical science, and have all been utilized by such students and teachers as Virchow, Pasteur, Koch, Lister, and Orth to build the structure of modern pathology upon the corner-stone laid by Morgagni over a century ago.

The activity of this brother of medicine and of surgery is not restricted to the confines of the dead-house or of the laboratory; on

the contrary, pathology renders assistance to all branches of the healing art, not merely by furnishing a correct diagnosis, but in determining the prognosis, and in indicating the treatment. When the ever-increasing importance of preventive inoculation and serum therapy is considered, it becomes evident that the time cannot be far distant when this youthful child of Æsculapius will become the master whose bidding surgery, medicine, and their kindred must need obey.

Only within the present decade pathology has been granted a place as a distinct study in the curriculum of our leading medical colleges; even now it holds a subordinate position or is neglected entirely in the minor schools. It is gratifying to observe, however, that its importance has been fully recognized by many practitioners in whose college days pathology was hardly more than a name. That such men as Osler and Delafield, whose professional duties are so arduous, can find the time and have the inclination to keep in the van-guard of medical progress, and patiently conduct the equally arduous and more exacting requirements of laboratory research, is an example which can hardly fail to excite the admiration and emulation of the younger members of the profession.

To the same class of student-practitioners belongs the author of this latest and in many respects the best addition to the practical applications of pathology. As a teacher and as a practitioner Dr. Senn's professional duties lie in the field of surgery rather than of medicine; his reputation would be great even if based solely upon his skill and success as an operator; but the pen is used by him with the same facility as the scalpel. Since 1889, when his first important work upon Experimental Surgery appeared, he has written exhaustive treatises upon Intestinal Surgery, Surgical Bacteriology, Principles of Surgery, and Tuberculosis of Bones and Joints. All of these have received merited approval by the profession, and some have become standard collegiate text-books.

The Pathology and Surgical Treatment of Tumors is the last literary production of this indefatigable worker, and will certainly add new lustre to its author's fame.

The first part of this treatise is devoted to a consideration of tumors in general, and is the part which is intended more especially for the use of students. The attempt is made to set forth our present knowledge of the structure and clinical tendencies of the different kinds of tumors in such a way that the practitioner may be enabled to make a reliable diagnosis at the bedside of the patient. A special effort has been made to trace every tumor to its proper anatomical and histogenetic source, and to make a sharp histologic and clinical distinction between true tumors, inflammatory swellings, and retention cysts.

A chapter is devoted respectively to the origin, morphology, anatomy, and etiology of neoplasms in general; the various pathologic changes which occur in tumors themselves are carefully explained; the clinical aspects of benign and of malignant growths are well contrasted.

Much stress is properly laid upon the importance of accurate diagnosis. Students are urged to lose no opportunity offered to extend their knowledge of the gross and microscopic appearances of all varieties of tumors, and especially to cultivate the *tactus eruditus*. In making a diagnosis, the clinical history, the length of time that the tumor has existed, its location, and rapidity of growth, the pain caused, and the structures involved should all be carefully considered, and the sources of error in each of these factors should be given due weight.

Examination of the patient is described and some hypothetical cases presented in which the contra-indications should prevail against an operation. Dr. Senn is very conservative, and many surgeons will not agree with his conclusions in all of these cases.

The examination of the tumor itself by inspection, palpation, acupuncture, and aspiration should be done, and whenever practicable pieces for microscopic examination should be removed either by direct excision or by the use of harpoons. It is possible that "the value of the microscope as an aid in the diagnosis of tumors has been greatly over-estimated," but this is because few surgeons are good patholo-

gists, and expect a more positive diagnosis than it is possible, truthfully, to give in many cases. The death of the Emperor Frederick, of Germany, is cited as an example of the errors that can be made. It is hard to believe that the blame rests upon the pathologist's report in the case. That carcinomatous degeneration is prone to occur in the base of a simple papilloma has long been known; it is equally clear that but one portion of the tumor is seen in the section examined; that one of the greatest of pathologists, Virchow, with all these facts in mind, should declare that the whole growth was benign when only the superficial portion was examined is most improbable. All the facts relating to that celebrated case will probably never be known.

"The writer does not wish to under-estimate the value of the microscope as an aid in a diagnosis of doubtful tumors, but he must insist that it cannot be relied upon in differentiating between a small, round-celled sarcoma, and some of the granulomata, under [some] circumstances. The microscope is an invaluable aid in the diagnosis of tumors, but the conclusions based upon the results of the examination are not infallible, hence the importance of a careful study of the clinical aspects of the tumor, followed by a thorough examination of the patient, of the tumor, and of its environments."

"It must be apparent to the student that an intelligent, reliable prognosis must necessarily rest on a correct diagnosis, and that a prognosis should consequently be withheld from the patient and his friends until the nature of the tumor has been ascertained by conclusive evidence. The prognosis in cases of benign tumors should be freely and candidly expressed to the patient, including the possible risks of an operation and its probable result. A different course should be pursued if the tumor is malignant. In such cases the surgeon should communicate to the patient's nearest relatives or friends the true nature of the tumor and the probable results of an operation; but such information should be withheld from the patient himself under ordinary circumstances. There are exceptions to every rule, and circumstances may arise which make it imperative on the part of the surgeon to tell the patient the whole truth."

The treatment of tumors, medical, surgical, and palliative, forms the last of these introductory chapters. It is both entertaining and instructive, and could be read with profit by both laymen and physicians. The claims of all forms of treatment are judicially considered, and the conclusions are logical. He is outspoken against the "Indian cancer doctor," and others of that ilk who flourish in this land of liberty. In the section devoted to cauterization he writes, "It is to be regretted that this method of treatment has fallen almost entirely into the hands of charlatans. The ignoramus fears blood; the public always has had, and always will have, faith in bloodless procedures; hence the great popularity which chemical caustics have enjoyed in the treatment of tumors. The war between caustics and the knife has been a long and bitter one, and it is by no means ended. The cause of caustics is defended by a great army of ignorant, irresponsible, money-loving quacks, supported and cheered by an admiring, misled public. On the side of the knife stands the honest surgeon who holds out only guarded promises, confronted by patients suspicious of his skill, and in great dread of a bloody operation. The ultimate victory of the knife must rest on earlier and more thorough operations."

The classification adopted differs materially from the one first proposed by Virchow, and also from that of Cohnheim, although, like that of the latter, it is based upon the histogenesis and clinical aspects of tumors. Dr. Senn classifies tumors according as they develop from the epiblast, mesoblast, or hypoblast, or combinations of these. Retention cysts are kept in the classification because of their clinical interest alone.

Of the four classes of tumors which have their origin in the epiblast or hypoblast, papilloma, adenoma, cystoma, and carcinoma, the last mentioned deservedly receives the most attention; indeed, this chapter is the most extensive one in the volume. The definition of carcinoma is like the author's definitions in general, concise and comprehensive. The various views, past and present, regarding the nature of carcinoma are fully given, but are of more interest to the historical student than to the practising physician. Squamous-celled,

cylindrical-celled, and glandular carcinoma are regarded as the typical varieties of this form of neoplasm, and each one is carefully described, the text being supplemented by representations of gross specimens, and by microphotogravures of characteristic sections. Heredity, traumatism, age, climate, mental depression, tuberculosis, prolonged irritation, and inflammation are the different factors considered in the discussion of etiology of carcinoma; the possibility of microbic infection in some form as the immediate and active cause of the disease is also admitted, but "until additional and more positive light is shed upon the microbic origin" we must adhere to the theory that "carcinoma is an atypical proliferation of cells from a matrix of embryonic epithelial cells of congenital or post-natal origin."

The more closely a carcinomatous tumor resembles an inflammatory product the greater is its malignancy. A rapidly-growing carcinoma must be differentiated carefully from infective swellings of all kinds, gumma, tuberculosis, actinomycosis, and chronic suppuration. The early diagnosis is of prime importance; the prognosis depends upon this and upon the histologic structure and location of the tumor. When an early and certain diagnosis is made, and the tumor is so seated as to be amenable to treatment, the results are most gratifying.

Dr. Senn, in common with every modern writer, insists upon the importance of early operative treatment. The time is past when carcinoma can be regarded as a constitutional or a blood disease; it is in its incipiency essentially local, and can be cured by thorough removal. Although believing that a radical operation should be radical, Senn is averse to that class of surgery which seeks to operate for the mere satisfaction of operating. Contra-indications are important, and should be given their full value. In advanced cases, even when the patient is willing to take all risks, "the surgeon has no moral right to become a legitimate executioner under any circumstances."

The various portions of the body in which carcinoma occurs are considered in order, and in this section of topography the practitioner will find many valuable details of actual operations. The removal of carcinoma affecting the lip, tongue, breast, stomach, intestines, and

generative organs are among the most important operations described; the advantages of each of several methods of removal are presented in each case. Thorough removal of glands by dissection is urged; the attempt to enucleate or tear away carcinomatous glands is nearly always followed by recurrence of or general carcinosis.

Fibroma, lipoma, myxoma, chondroma, osteoma, angioma, lymphangioma, lymphoma, myomata, neuromata, and sarcoma are grouped together as mesoblastic tumors. Each variety is made the subject of systematic discussion in a separate chapter, and the proper perspective of relative importance is well preserved.

The chapter on myoma is of value, not so much for the description of the tumor itself, but from the excellent presentation of the various forms of treatment, especially when the uterus is the seat of the disease. Vaginal hysterectomy, vaginal myotomy, ablation of the adnexa, and the forms of abdominal hysterectomy are among the recognized surgical procedures that are given.

The most malignant of all tumors of mesoblastic origin is sarcoma. The chapter upon this subject ranks with that upon carcinoma in practical importance. Senn recognizes ten varieties; round-celled, spindle-celled melano-sarcoma, and glioma are the principal ones of the list. Much stress, too, is very properly laid upon the regressive metamorphoses and metastases which occur so frequently in tumors that lack a well-developed reticulum.

The treatment of sarcoma by means of inoculation with pure cultures of streptococcus erysipelatis or in combination with micrococcus prodigiosus is mentioned. The good results reported by Coley, of New York, are encouraging, but other investigators have not succeeded so well. "The treatment of inoperable cases of sarcoma by this method should be encouraged and persistently carried out." At the present time, however, a radical removal by the knife is indicated in all cases where the tumor is seen at a sufficiently early date. Of the numerous operations described, those upon the upper and lower jaws are of most importance.

When all three of the germinal layers contribute to the develop-

ment of the neoplasm, the resulting teratoma is often of the greatest interest. In the chapter devoted to the consideration of this form of congenital growth branchial and dermoid cysts receive the most attention.

Cysts "due to the retention in a pre-existing space of a physiological secretion or excretion by obstruction of the outlet of a gland" are classed with tumors solely for clinical reasons. The thyroid gland, the uterine adnexa, and the kidneys are among the important organs which are subject to such enlargements. The major portion of the chapter is devoted to cysts of the pancreas. As the literature upon this subject is very meagre, this valuable contribution is welcome.

There are some features of the book as a whole which at once attract the notice of the reader. The illustrations are especially noteworthy. In the volume of 700 pages there are 515 engravings, including thirteen full-page plates, many of which are colored. Microphotogravures are numerous and are well reproduced. More than one hundred of the illustrations are original, having been prepared from morbid material collected by the author himself. They represent, therefore, conditions which exist in our own country, and are the more valuable on that account.

The work is made of great value to students by the system of italicizing definitions and important statements; thus the neophyte in pathologic studies is aided in the appreciation of relative values.

H. P. DE FOREST.

AN INTRODUCTION TO PATHOLOGY AND MORBID ANATOMY. By T. HENRY GREEN, M.D., F.R.C.P. Seventh American edition, revised and enlarged by H. MONTAGUE MURRAY, M.D., F.R.C.P. Philadelphia: Lea Brothers & Co., 1895.

The English language as yet offers only introductory works on the subject of pathological anatomy. We must still go to the German for fundamental treatises.

Since this work left the hands of Dr. Green it has been revised

and rewritten and kept well up to the times. It is true, however, that the rapidly accumulating knowledge of this subject largely involves the finer and more delicate studies which lie entirely beyond the scope of a primer of this sort; and so its revisions are actually not parallel with the advancement of the science of pathological anatomy, as it takes no cognizance of the vast amount of real fundamental knowledge which is being piled up by experimental work and laboratory investigation. Such things as do come within the scope of the work are faithfully described in the light of our most recent knowledge.

The book is well written in concise and lucid sentences. It is illustrated with 224 engravings, and altogether reflects credit upon the authors and publishers.

JAMES P. WARBASSE.

A MANUAL OF OPERATIVE SURGERY. By LEWIS A. STIMSON, B.A., M.D., and JOHN ROGERS, JR., B.A., M.D. Third edition. Philadelphia: Lea Brothers & Co., 1895.

The numerous changes which have been introduced in operative surgery in the way of new operations and modifications of technique have made it necessary in the preparation of this third edition to almost wholly rewrite the book.

This third edition of the work has been almost entirely written by the junior author, with the previous edition as a guide. The book contains clear and concise descriptions of the most important operations of modern surgery. It is well illustrated, and we take pleasure in recommending it to the profession as a handy descriptive manual of operative surgery.

JAMES P. WARBASSE.

CORRESPONDENCE.

TWO ADDITIONAL CASES OF ANEURISM OF THE THIRD PORTION OF THE RIGHT SUBCLAVIAN ARTERY.

THE following two cases should be added to the number collated in the paper published in the November and December issues of the ANNALS OF SURGERY.

EDMOND SOUCHON.

1877. Luther Holden. *Amputation at Shoulder; Death.*—Man, aged forty-four years; aneurism of the right subclavian artery, size of a small orange; it occupies the whole of the supraclavicular fossa; it extends inward under the sterno-cleido-mastoid; backward beneath the clavicle, which is pushed forward and partially absorbed; slight pulsation over the episternal notch; impossibility to apply a ligature on the proximal side of the artery; ice-bag; direct compression on sac; simultaneous compression of common carotid and brachial; no improvement; amputation at the shoulder, after ligation of the axillary below the clavicle, through the pectoral, close to the coracoid process; pulsation not distinctly diminished after amputation; increase of the swelling and brawny induration of the cellular tissue, extending also below the clavicle over the scapula and even to the integuments of the stump itself; death on thirty-seventh day; surrounding the second and third portions of the subclavian and the first portion of the axillary was a mass of semisolid blood-clot, which lay in a sac formed by the matting of the surrounding structures; the aneurism involved the third and second portions of subclavian artery. The author states that the above is the second case on record of amputation at the shoulder-joint for a sub-

clavian aneurism.—*St. Bartholomew's Hospital Reports*, 1877, pp. 229–235.

1885. W. Cameron Morris. *Ligation of Subclavian at Outer Edge of Scalenus Anticus; Cure.*—Woman, aged (?); tumor above clavicle in the course of the subclavian artery,—*i.e.*, the third portion of the artery; the structures lying over the aneurism were carefully divided and the aneurism itself exposed, the aneurism was fusiform; it involved also the axillary artery for more than an inch; there was about half an inch of apparently healthy artery between the outer edge of the scalene and the commencement of the aneurism; a point midway in this healthy part was selected for the ligature, the sheath opened, a double ligature of No. 1 chromic-carbolized catgut was passed from within outward; ligatures tied firmly, but not forcibly, and the resistance of the artery gave the impression of healthy coats; primary union; recovery slow but steady; radial pulse fairly good, but much inferior to that of the wrist.—*Lancet*, London, 1885, Vol. II, p. 152.

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THE DIAGNOSIS AND TREATMENT OF SURGICAL RENAL DISEASE.[1]

By HOWARD LILIENTHAL, M.D.,

OF NEW YORK,

ASSISTANT SURGEON TO MT. SINAI HOSPITAL.

CASE I.—*Nephrolithiasis with Suppuration; Nephrectomy.*—Mrs. A. Z., thirty-six years old, married seventeen years, and the mother of five children, entered Mt. Sinai Hospital on May 5, 1895. For a number of years she had resided in Texas, her present home. The patient's history before the onset of her renal trouble, about four years ago, was, medically, uneventful. The first symptom noted was frequent urination, particularly marked after the patient had been much on her feet. Then there was an attack of painful micturition with foul-smelling urine accompanied by symptoms of fever. No blood was ever noted. Gradually pain in the left lumbar region developed and the sensations extended intermittently downward towards the groin. It was for this pain that she finally sought relief.

When first I saw her I noted that she was a brunette of average size and development, not emaciated, but somewhat anæmic in appearance. Inspection of the thorax and abdomen was negative. The patient's pulse, respiration, and temperature were never out of the normal. On palpation, as if to feel the left kidney, a hard, smooth tumor was easily found. The mass extended well towards the median line. Bimanual pressure, unless it was quite firm, caused no pain. Nothing abnormal was to be discovered on the right side. Urine to the amount of fifty-five ounces was passed in twenty-four hours. A specimen was acid, specific gravity 1012, and there was so much pus that the examination by microscope was not satisfactory in determining the presence of renal elements.

Shortly after admission I examined the bladder by cystoscope,

[1] Read before the New York Surgical Society, January 8, 1896.

not using anæsthesia. The vesical wall looked, for the most part, normal, but the orifices of the ureters were congested and their mucous membrane seemed everted, reddened, and swollen, their appearance resembling the male meatus during an acute urethritis. While examining the right ureter firm pressure was made over the corresponding kidney. The observation was negative. The left orifice was now brought into view and examined in a similar manner during firm pressure on the tumor. At first this, too, yielded no information, so I again turned to the right ureter when the woman complained of an attack of her pain along the left side. Quickly shifting the instrument to bring the opening once more into the field I was at first unrewarded, and had almost concluded that the examination would be fruitless, when I saw issuing from the left opening, with a slow, snake-like motion, a long grayish plug or cast which coiled itself upon the bladder floor and showed no tendency to mix with the liquid contents of the viscus. At the same time the patient was relieved of her pain.

The diagnosis of kidney abscess with thick cheesy pus seemed to be safe enough, so on May 20, under chloroform, I made a transverse lumbar nephrotomy, disclosing a perinephritic abscess, kidney abscess, and large stony masses in the kidney. A free opening was made, and about a handful of phosphatic stone removed by the fingers and sharp spoon.

The patient recovered well from the operation, but, as in most similar cases, there persisted a sinus. The pains in the left side disappeared, but pain in the right kidney became a prominent and annoying symptom, and though there were no objective signs, and in spite of the fact that the urine, now clear, contained albumen with hyaline and granular casts, I determined upon the advisability of a right nephrotomy. Dr. Gerster, who saw the patient in consultation with me, agreed as to the propriety of the step, so on June 21, just a month after the first operation, I cut open the other kidney from the cortex into the pelvis. No observation was made except that the kidney tissue was considerably harder than the normal, due, in all probability, to interstitial nephritis. Recovery from this operation was also uneventful. Twelve ounces of urine passed by the urethra in the first twenty-four hours, but within a month under the influence of copious draughts of water the quantity rose to fifty-four ounces. The wound rapidly closed, and the left lumbar wound, also contracting, gave rise to symptoms of pus-retention. It was now evident that the

left kidney was functionally of little or no value and that its presence was a menace, so on August 20, Dr. Gerster assisting, I again operated upon the unfortunate woman, and removed the left kidney by lumbar nephrectomy. Adhesions were so massive that a rubber ligature had to be placed around the pedicle and the kidney ablated above, the stump being left to slough away. The patient was discharged from the hospital on October 9, 1895. She was then passing plenty of perfectly clear water, but there was much albumen present with hyaline and granular casts. The pain in the kidney is unrelieved, but no uræmic symptoms have apppeared.

This is one of those cases which calls attention to the importance of sufficiently long and thorough cystoscopic examination, and to the advantage of doing the work, if possible, without anæsthesia. Thirty or forty years ago John Hilton called attention to the general diagnostic value of pain, and in the present instance it is shown that the sensations of the patient during cystoscopic examination may give warning of the passage of abnormal matter through the ureter, so we may not miss the important moment when it can be observed entering the bladder. One positive observation is worth innumerable negative ones.

We seem here, too, to be dealing with an exception to the rule of many eminent surgeons, which is, that nephrectomy under any circumstances is forbidden unless the other kidney be healthy.[1] It seems that this rule might better read, "unless the other kidney be sufficiently healthy," this condition to be determined by examination of the urine from that kidney.

The third and most interesting point is the demonstration of the great amount of surgical interference sometimes tolerated by the diseased kidneys. Usually suppression is an ever present danger in even slight manipulation of the urinary passages where renal disease exists, yet here every conceivable provocation was given without the appearance of a single alarming symptom.

CASE II.—*Sarcoma of Kidney; Extirpation; Recovery.*—A little girl, aged two years and nine months, was brought to Mt. Sinai Hospital, also from the South (Alabama), to see what might be done for

[1] *Vide* Winiwarter, Lehrbuch der Chirurgie Op., Stuttgart, 1895.

a large abdominal tumor. Measles, from which the child had completely recovered about a year before, was the only known illness in her history. Both parents were apparently healthy. A few months (exact date unknown) before the little patient came to New York, it was observed that her abdomen was swollen. Her physician thought at the time that there was enlargement of the spleen due to malaria, but the mass increased rapidly in size in spite of treatment and the child emaciated and became apathetic. There was never any pain nor any disturbance in urination. When I first saw her, in May, 1895, she was thin and cachectic-looking and was decidedly under-

Dr. Lilienthal's case of sarcoma of the kidney, after recovery.

sized. The abdomen was enormously distended by a firm resistant tumor, which apparently originating on the left side, seemed to fill the abdomen and pelvis. The entire belly was tense, the umbilicus everted, and the cutaneous veins very much enlarged. The respiration was somewhat impaired by pressure. In spite of the tense condition of the abdomen, however, the skin was movable and the mass could be moved from side to side enough to show that it was not firmly fixed to the skeleton. Pressure upon the tumor was not painful. It was quite smooth in contour and no splenic edge or notch could be felt. For the first few days the urine was normal, but later a little

blood made its appearance. On June 1, under chloroform, I made an exploratory incision in the usual place for exploration of the kidney and at once came down upon the tumor. It evidently arose from the lower half of the left kidney and extended downward into the pelvis farther than my index-finger could reach. The incision, made down to the peritoneum, was rapidly carried forward. The peritoneum was now pushed forward and the incision continued to the median line and downward to the symphysis pubis, attempts to deliver the tumor being made at various stages of the operation. The child was put in the Trendelenburg position, still on its side, with the hope of facilitating the removal of the tumor from the pelvis. Even now, however, with this enormous incision, it was not possible to extract the growth, so, after exploring as far as I could with my finger and finding no apparently dangerous adhesions, I determined to ligate the renal vessels and ureter, trusting that the tumor might then be removed without further enlargement of the incision. This ligation was performed with separate ligatures of catgut, when, to my satisfaction, it became possible to deliver the tumor by pressure from without. The mass had to be turned, however, so that it came out lengthwise, the healthy part of the kidney first and the pelvic part of the growth last. A few adhesions were peeled or ligated, the ureter was retied as low as I could do it, and the enormous wound was rapidly closed with tiers of catgut sutures. A strand of iodoformed gauze was left to drain the deeper parts and emerged at the posterior angle. The operation lasted over an hour, not on account of technical difficulties, but because it was my wish to prevent hæmorrhage and to avoid opening the abdominal cavity. In both I fortunately succeeded. The patient's pulse had weakened during the operation, but she was not at any time in a critical condition.

The first urine contained blood and was scanty, but it rapidly became clear, cups and counter-irritants were kept pretty constantly over right kidney until the danger seemed past. Microscopical examination of the clear urine the second day showed hyaline casts, blood, and renal epithelium. There was no fever worth recording after the second day, and the wound, with the exception of a stitch abscess, healed promptly, the sinus where the gauze-drain had been being the last part to close. One troublesome symptom was present during the entire after-treatment of this case, and that was enormous distention of the abdomen by gas in the bowels, principally the colon. The patient was relieved by enemata of peppermint-water and by the

simple passing of a rectal tube, but in a few hours the distention would be as great as ever. There seemed to be a paresis of the intestinal walls. Even when the child left the city, nearly two months after the operation, she had to be relieved by tube or enema two or three times a day.

It is interesting to note that the emaciation, the apathy, and the cachexia rapidly disappeared.

The tumor proved to be a round-celled sarcoma with a necrotic centre.[1] It weighed but two and a half pounds, though its size in relation to that of the child was very great.

The photograph shows the lateral and anterior parts of the incision, and it certainly is remarkable that, extensive though it was, the peritoneum was not even button-holed.

CASE III.—*Multiple Metastatic Abscesses in both Kidneys; Double Nephrotomy; Recovery.*—Louis M., a Russian, thirty-four years old, had two upper incisors extracted on March 2, 1895. His history before that date has no bearing on the case. Immediately after the dental operation there were symptoms of acute wound infection which progressed until on March 12, when I first saw him at the hospital, there was œdema of both cheeks, and evident fluctuation over the entire roof of the mouth. Pus exuded from the tooth-sockets, at the bottom of which was bare bone. On March 15, under chloroform, I made numerous free incisions in the roof of the mouth and also opened through the mouth a large pus-cavity on the anterior face of the upper jaw. The wounds were packed with iodoformized gauze, and all went well for a week, when a chill and temperature 105° F. ushered in an attack of erysipelas, which sent the man to the isolation house. In a week, on March 29, all symptoms having subsided, he returned to the ward, and two days later I removed with forceps a large loose piece of necrosed alveolar process. The wound now rapidly granulated, and early in May the man left the hospital as "recovered." Two days later he returned complaining of severe pain in his abdomen, worse over the right lobe of the liver and in the right lumbar region. The pain was aggravated on hyperextension of the right thigh, and though greatest over the liver it radiated downward. There was constipation, moderate fever, more marked in the afternoon, and there had been chilly sensation. The urine was clear, acid, specific gravity 1040, and contained a trace of albumen. The day after admission (*i.e.*, on May 5) a severe chill

[1] Pathological examination by the hospital pathologist, Dr. F. S. Mandlebaum.

occurred with temperature of 105°. The man was now etherized for exploratory operation. The diagnosis, in my opinion, lay between abscess of the right kidney and abscess of the liver, with the balance in favor of the kidney-trouble, because the pain radiated downward and was increased by hyperextension of the thigh. By far the greatest tenderness, however, was at a point about at the border of the ribs and midway between the axillary and anterior median lines. This spot was exquisitely sensitive to light pressure and the pain increased with the exertion of more force. Because of the latter fact I allowed myself to be persuaded by the house surgeon to puncture here with a fine, long needle. Pure blood was the result from various directions. I now exposed the right kidney by transverse lumbar incision, and puncture yielded a few drops of thick pus from near the cortex. Opening along the needle-track with a pair of slender dressing forceps I came upon a small abscess in the parenchyma of the organ. On account of the perfectly clear urine and the absence of all pain or difficulty in micturition I did not open the pelvis, but packed the wound with iodoform gauze and sent the man to bed. The pain in the right side now disappeared, but fever of a septic type continued. Every day there was a rise to 103° to 105° F., followed by sweating and accompanied by great prostration. There was much nausea and vomiting of the simplest foods, with naturally a rapid emaciation. The discharge was slight and the wound showed a strong tendency to heal. On May 20 I aspirated the kidney once more without anæsthesia, and finding an abscess with one-half ounce of pus in the lower part of the renal parenchyma I opened and packed it. The urine even now contained merely a trace of albumen with no signs of pyelitis, but a few days after this aspiration a few blood cells and leucocytes were noted together with granular casts in a urine rendered dilute (1010) by the ingestion of much water and milk. From now until about the 10th of July the patient's general condition grew steadily worse. He became profoundly anæmic in spite of all my efforts to combat it, so that by this time his skin and mucous membranes had assumed a yellow, waxy appearance. He was somnolent and delirious by turns and his temperature varied between 94.8° and 104° F. With all this systemic disturbance and in spite of the man's great weakness he did not complain of anything in particular, and though he was emaciated to the last degree, rendering physical examination most easy, I could not find a point of tenderness anywhere about him. I requested Dr. Gerster

to see the man, and though he gave a bad prognosis he advised exploring the left kidney. The patient at first refused to be cut again, and one could certainly not blame him, but a few days later he reconsidered and begged that any means of possible value be tried. Accordingly, on July 23, I again chloroformed the patient and performed a left transverse lumbar section. The needle now showed an abscess of medium size, and on nephrotomy other smaller ones were disclosed. The man was so weak and anæmic, however, that, fearing a death on the table, a wide section through the kidney into its pelvis was rapidly made and the whole wound packed with gauze. The right kidney wound had closed, but I reopened it now and evacuated a large perinephritic abscess and also a few small pus foci in the renal tissue. Packed and dressed wet. There was after this operation so much blood and other discharge in the urine besides the escape through the wounds that the twenty-four-hour amount could not be determined. The man's condition was about as before with the addition of vomiting, then diarrhœa with occasional involuntary stools containing a little blood. The fever had abated, though the temperature was always either subnormal or a little elevated, and the poor fellow was apparently moribund. There seemed to be nothing more to do. On August 20, just four weeks after the double nephrotomy, the nurse told me that for a number of days he had noticed that the stools of the patient contained large quantities of undigested food. I immediately ordered a peptonized diet by mouth and rectum, something to be given every half hour. To my great satisfaction the vomiting and diarrhœa ceased, and from that day, I might almost say from that very hour, there was a constant and uneventful improvement. The wounds which had been kept open by packings were allowed to close. The urine cleared up so that on September 2 it was clear, and, though there was a trace of albumen, no casts were found. On September 29 the man was discharged recovered, after a residence of over half a year in the hospital. During at least five months of this time his death was daily expected.

If I may judge by the meagre literature of the surgical treatment of acute multiple kidney abscess, not resulting from trouble in the lower urinary tract, this condition is one rarely recognized during life. Steven[1] says that the matter has not

[1] Glasgow Medical Journal, 1884, p. 161.

received the attention it deserves, because it is secondary, usually, to some other disease and is hard to recognize. To be sure, the foci will, in time, coalesce, forming larger and fewer abscesses with great destruction of tissue; a state of affairs far easier to diagnose, but correspondingly ominous for the patient.

These kidney abscesses are evidently metastatic,—*i.e.*, they are due to the plugging of the renal vessels by septic emboli. According to Israel[1] this form of suppurative nephritis is commonest as a sequela of ulcerative endocarditis and traumatic pyæmia. The pathology may be the same when the disease is secondary to an ulcerative tuberculosis elsewhere, or to other infections, as, for example, actinomycosis or dysentery.

Ziegler[2] says that erysipelas germs may get into the blood and cause metastases.

Usually metastatic abscess of the kidney affects both organs, the only exception to the rule being in ulcerative endocarditis, where an embolus of good size *may* be washed into one renal artery.[3]

Councilman[4] has made the interesting discovery that when staphylococcus aureus is put into the ear-vein of a rabbit abscess of kidney and of myocardium follows. This curious circumstance is not to be explained by the fact of the kidney and heart circulations being terminal, because the brain and spleen, also terminal, usually escape.

Abscesses of the kind under discussion are rarely, if ever, found in the pyramidal portions of the kidney, but because of the peculiar arrangement of the renal vessels they are almost always at or near the cortex.[5] There is, therefore, no pus in the urine, and the classical signs of pyelitis are absent. Neither the cystoscope nor the ureteral catheter can help us make a diagnosis, and as the kidney is not enlarged in size until the case has become practically hopeless we are forced to depend on subjective signs,

[1] Virchow's Archives, No 74.

[2] General Pathology, translation from the eighth German edition, edited by Buck.

[3] Steven, loc cit.

[4] Dennis's System of Surgery, Vol. I.

[5] Steven, loc cit.

together with the general evidences of septic absorption, and the history of recent infectious disease,—in my case osteomyelitis and erysipelas. Local pain and tenderness is most marked early, when the tension is great and the parts have not by gradual distention become insensitive.

When this form of kidney abscess is suspected, it is my belief that early nephrotomy is indicated. The miliary abscesses, with perfectly healthy tissue between, will soon turn into large collections of pus destroying the entire organ. Pus in the urine may be one of the last signs to appear. The nephrotomy, except in cases with unilateral symptoms following ulcerative endocarditis, should be double, and both kidneys should be opened at one sitting, or with a very short interval. It would seem wise to incise the organs in more than one place and from the cortex inward, but I should not advise opening into the renal pelvis for fear of infecting the lower urinary tract. I am convinced that the natural cure of abscesses of this kind is by perforation outward, with the formation of perinephritic abscess which, in its turn, may be opened externally by nature or by the knife. Perinephritic abscess from this cause has often been seen in the post-mortem room.[1]

It has been my fortune to operate in several cases of enormous double lumbar abscess following typhoid fever and other septic conditions (one was a pyæmia after an operation for hæmorrhoids) where no direct cause of the suppuration was found. These cases had progressed so far that it was impossible to say what their origin had been, and they were put down, vaguely, as "retroperitoneal." Now, in the light of Councilman's experiments, I think it more than likely that the kidney was their starting-point.

It seems to me quite reasonable, from the reports of the pathologists, to suppose that many deaths from kidney suppuration secondary to infections, such as scarlatina, erysipelas, and ulcerative enteritis, might have been avoided by timely nephrotomy. Only a small proportion of those affected live long enough for spontaneous cure through perinephritic abscess.

[1] Steven, loc cit.

My conclusion is that in all cases of multiple metastatic abscess—so-called pyæmia—the kidneys should be incised at the first symptom of their involvement and before urinary symptoms supervene.

That whenever, after an acute infectious disease or during its course, there is persistent fever with pain and tenderness in the renal regions the idea of nephrotomy should be entertained.

I believe that early surgical intervention in these cases will some day be the rule instead of the rare exception.

RELIEF OF TYMPANITES BY POSTURE.

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FEW complications in abdominal cases, both medical and surgical, give rise to so much distress, and, if unrelieved, so certainly produce death as extreme intestinal distention. Some years ago I was called to a case of this kind. My patient was a woman between forty and fifty years of age. I found her pulseless at the wrist. On examining the heart its action was markedly tumultuous, her breathing shallow and rapid, her face and hands were cold and covered with moisture. Hoping to improve the heart's action, I at once raised the foot of the bed some two feet. In her distress she kept constantly rolling. Finally she settled on the right side and before many minutes the obstruction was removed, the tympanites promptly disappeared, and her general condition became practically normal as far as this difficulty was concerned. I was agreeably surprised at the sudden improvement so promptly developing after the elevation of the foot of the bed. Having some time before this noticed, in treating a case of stricture of the sigmoid portion of the colon, that the dilators were introduced with increased ease, when the patient was placed in the Sims's position, the hips being well elevated, I decided that the relief resulted from some change brought about in the folds of the rectum. I have since continued to employ position as a means of relief in all cases of tympanites, both medical and surgical, before resorting to more heroic treatment. It was not, however, until last winter, when on a visit to Dr. Howard A. Kelly, of Baltimore, that I fully appreciated the amount of alteration which takes place in the

arrangement of the rectal folds when one is placed in the knee-chest position. One day, while watching Dr. Kelly make a rectal examination, I was able to see Houston's folds in their usual position, but the patient being kept in the knee-chest position, gradually the rectum straightened out, the additional length being contributed to, by these folds, which absolutely disappeared into the bowel wall. Here was a complete and satisfactory explanation of the relief secured in the great majority of cases of tympanites in which posture had been employed as a means of relief. Sometimes it is necessary to keep the hips in this elevated position for ten or fifteen minutes before the contents of the abdominal cavity gravitate sufficiently from the pelvis to enable the upper portion of the rectum to pass out of the pelvis towards the abdominal cavity. Until this occurs, of course, no relief is secured. In cases of marked tympanites the distention is practically confined to the large intestine, and it would appear that the obstruction to the escape of flatus is due to the downward pressure of the descending colon and sigmoid flexure upon the upper portion of the rectum, forcing the folds of Houston one upon the other, and bringing about, in this way, what is for the time in effect an impermeable stricture. If an attempt is made to pass this obstruction from below the soft rubber tube will coil upon itself, and fill that portion of the bowel just below the folds. The most rational method of relieving this obstruction and liberating the imprisoned gas would seem to be the inversion, or partial inversion, of the patient, and removal through the aid of gravitation of the pressure from above, which has converted the mucous folds referred to into an absolute obstruction.

The value of this expedient, as a remedial measure, in tympanites, which so frequently follows intestinal surgery, has recently been emphasized by an experience with a case of bile-duct obstruction, in which anastomosis had been established between the gall-bladder and the duodenum. Some thirty hours after the operation the medical man in charge of the case, and with whom I had been associated at the time of the operation, telephoned me that his case was in extreme danger. She had developed, to a marked degree, the usual symptom of abdominal distention, and

her attendant, after adopting all the measures usually employed in this condition, feared immediate heart-failure. After hearing the treatment he had adopted, I advised him to place his patient in the knee-chest position, this, notwithstanding the fact that it was only thirty hours since the operation was done, and that the drainage-tubes were still in the wound. He adopted the suggestion, and in less than five minutes his patient had secured absolute relief.

If my experience be confirmed in the practice of others, it would seem a pity that none of the many works treating upon the subject of abdominal surgery make mention of this as a possible means of affording relief in this condition. And its application is by no means confined to surgery, for in typhoid fever and the other forms of intestinal disturbance, which so frequently give rise to this condition, the remedy promises to be equally safe and satisfactory.

There is, however, one notable exception, and that is in severe cases of general peritonitis. Here it is questionable whether one is justified in resorting to the position. In the cases in which I have employed it, no good has resulted from it. There was, however, no evidence of its having inflicted any injury.

While the knee-chest position may answer best in cases of extreme distention, the placing of the patient upon the side, with elevation of the foot of the bed, will commonly secure relief in cases of moderate distention.

Among other remedies spoken of as being worthy of a trial in this condition we find enemata of turpentine, creosote, and assafœtida. The same remedies are frequently resorted to and administered by the mouth, as are also alcohol, charcoal, ginger, capsicum, and other carminatives. The frequency of our disappointment in connection with the administration of drugs is readily explained. During extreme distention the stomach and bowels have not only their power to contract, but also that to absorb absolutely paralyzed. If relief be not too long delayed, the removal of the distention is followed by a marked increase in peristalsis. If purgatives have been freely administered, the distention being relieved, peristalsis may be excessive and a severe diarrhœa caused,—a form of cumulative action.

A form of treatment which at one time had many advocates, but which now has become practically obsolete or, if employed at all, is simply used to secure euthanasia, is puncture. The one indication for puncture in excessive tympanites would appear to be malignant obstruction where abdominal section was contra-indicated or declined. In excessive distention it is usual to find the distention practically confined to the colon, sometimes in the stomach, rarely in the small intestine. When in the latter position, puncture gives but little relief unless applied at so many points as to render the development of peritonitis probable, if situated in the stomach, relief is secured with greater safety and equal promptness by means of a stomach-tube; if in the colon, the knee-chest position, with, if necessary, the insertion of a gum-elastic tube, offers at least as good a prospect of relief as puncture without the risk attending that operation. The danger in puncture will practically be from one of two causes, hæmorrhage or fæcal extravasation; hæmorrhage when the triangular or spear-pointed trocar is used, and extravasation, from the production of a wound in the intestine larger than that required for the removal of the gas. Just as a pin-prick in a piece of rubber tissue stretched over a convex surface rapidly becomes a large rent, so, often, puncture in extreme intestinal distention has resulted in a rent of the intestinal wall, altogether out of proportion to the size of the instrument with which the wound was produced. Examination of the intestine post mortem gives very little idea of the size of the wound in the intestine while distention existed. This, doubtless, will explain many of the cases in which extravasation, peritonitis, and death occurred, and where, after death, considerable difficulty was experienced in discovering the point at which puncture was made. Of course, the better the condition of the bowel, the more prompt the contraction, the shorter the time allowed for extravasation of the intestinal contents. Cases of extreme and long-continued distention without the evidence of peritonitis with plastic exudation would seem to be the least favorable for this form of treatment, which under the very best conditions must always remain somewhat hazardous.

NOTE ON DRAINAGE THROUGH THE RECTUM OF PELVIC ABSCESSES DUE TO APPENDICITIS.[1]

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ONE of the approved methods of dealing with the circumscribed abscess that results from appendicitis is its evacuation at a convenient point in its periphery. The abscess is opened and the surgeon simply passes his finger into the cavity to assure himself that the opening is ample and unobstructed. This, I say, constitutes the operation. There are cases in which the operator makes no search for the origin of the abscess, does not even syringe out the cavity or pack it with gauze. The simple evacuation of the cavity through an incision which permits an uninterrupted flow of the purulent contents has resulted in frequent and perfect recoveries.[2]

In three cases I have found, at my first visit to the patient, a tumor occupying the pelvis, pressing down upon the rectum and bladder, and within easy reach of the finger. The first case occurred in a girl of ten years, the second in an adult male, the

[1] Read before the Section on Surgery of the College of Physicians of Philadelphia, November 8, 1895.

[2] The danger of trifling with a walled-off abdominal abscess is better understood to-day than formerly. Before appendicitis was understood, a friend of mine had the following experience: An abscess formed in the right iliac fossa, which he opened with an immediate and free flow of offensive pus. Satisfied that he had done his full duty, he was about to dress the part, when a surgeon standing by requested the privilege of passing his finger into the opening. This was granted; the finger was passed deeply into the cavity and swept freely around. A rapidly fatal general peritonitis followed. The interpretation that the modern surgeon would put upon this case is that the finger was driven through the delicate adhesions that walled off the cavity and converted a local into a general and fatal septic peritonitis.

third in a girl of sixteen. The treatment in the first and second consisted in the evacuation of the abscess without care to subsequent drainage or irrigation. In the third a pair of forceps was left in the wound for two days, with jaws separated to keep the passage free. The first and second closed as promptly as such abscesses usually do, but the third showed a tendency to close prematurely and required drainage; it closed in about six weeks. The last case operated upon has been seen after a lapse of a year and a half; she is perfectly well. One of the other cases lives in the city and would report if there was a return of the symptoms. The condition of the remaining case I cannot report upon; he, however, left the hospital perfectly well. I am inclined to the opinion that recovery was perfect and permanent in all.

These cases illustrate an easy way of dealing with a pelvic abscess, situated within a circumscribed peritoneal cavity. It is a rational procedure, as it gives vent to a large accumulation of pus at the *lowest and most dependent point.* It is practical and may be resorted to without elaborate preparations. It hardly rises to the dignity of a surgical operation, and may be performed by any one who undertakes the simplest surgical ailments. The region of the tumor is at safe distance from any vessels of consequence, and the path of the bistoury extends only through the anterior wall of the bowel and through a single thickness of the peritoneum.

Before making the incision, the bladder should be explored and, if necessary, emptied. In a female one finger may be passed into the vagina and the other into the rectum, and the point determined upon for puncture. The puncture may be made by a groved director on a blunt-pointed instrument and subsequently enlarged with the bistoury.

Of course, when the origin of the abscess is a foreign body, like a concretion or a pin, the draining of the abscess may not be radical. It will, however, remove the danger of rupture of the circumscribed abscess, a danger that cannot be over-estimated, a condition that cannot be postponed, and leave the removal of the appendix to a remoter and safer stage in the procedure.

I would call attention to a single symptom common, I im-

agine, to all pelvic abscesses,—viz., a firmly contracted and resisting sphincter ani,—whether this is due to the action of the voluntary fibres and made tense through fear, or whether it is constant and the result of pain, I cannot tell. In some instances the constriction is so tight that the termination of the gut projects outward like a nipple, or like the neck of the uterus.

There were symptoms connected with the last case that are instructive. The history was that of a typical appendicitis. On reaching and examining the case there was no doubt of the presence of an abscess, but there were good reasons why no attempt should be made to reach it through the abdominal walls. First, there was not a well-defined area of dulness. Second, there was a distinct wave that passed across the abdomen when it was percussed, and this in a girl with thin abdominal walls. This wave I had never before experienced in acute appendicitis, and I interpreted it to be due to serum, and not associated with the localized abscess. Upon draining the abscess the wave was less distinct, but still capable of being elicited. Had I attempted to reach the abscess through an opening in the abdominal walls, I am quite certain that I would have entered the general abdominal cavity, a circumstance that greatly complicates an otherwise simple operation, and one too often followed by a fatal issue.

In my first case I hesitated about draining the local abscess into the rectum. I argued that fæcal matter would pass from the bowel into the abscess cavity and a permanent fistula result. The fact that all three cases did well, and healed earlier than many do that are drained at a less dependent point, is certainly encouraging, and would lead me to adopt this method in fæcal abscess presenting at the pelvic outlet rather than using a vaginal thoroughfare when the abscess occurs in females. I report the cases that they may serve as a precedent in similar cases. Three cases do not establish a safe precedent, and further experience may point out dangers at present not conceivable.

NOTE ON THE POST-OPERATIVE TREATMENT OF WRY-NECK.

By EDWIN M. COX, M.D.,

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THE incompleteness of detail in the descriptions in many surgical works of the immediate after-treatment of torticollis, and the excellence of the result in one case, prompt me to offer the suggestion embodied in the following description of the treatment in that case. The patient was a girl of twelve in whom the deformity had existed from birth, and was therefore of the so-called congenital variety, the exciting cause of which was presumably some injury to the musculature of the neck during parturition. There was well-marked asymmetry of the face, and the sterno-mastoid was reduced to a length of about three inches, thus making the distance between the mastoid process and the sterno-clavicular articulation very short. The process was, under ordinary circumstances vertically above the articulation in question. There was a moderate degree of scoliosis. In fact, the patient presented all the characteristics of a well-marked case of torticollis from shortening of the sterno-mastoid. There was no spasm in any of the muscles of the neck, and inability to overcome the deformity either voluntarily or by ordinary manipulation was due simply to shortening. The child had never undergone any treatment.

It had struck me that the after-treatment could be much shortened and the results improved, if the patient, during the healing of the operation wound, could be put into a rigid dressing with very careful regard for the separation, by as great a distance as possible, of the mastoid process, and the sterno-clavicular articulation. On this point authorities do not speak very definitely, and it is really the crucial point in the matter. Hoffa

says, in his "Orthopædic Surgery," "The after-treatment of the wound is very simple. . . . The head is placed in an over-corrected position, and fixed by a permanent dressing. About fourteen days after operation, one begins the most important part of the treatment, the orthopædic." This writer does not say, though it may be presumed that he means by "over-corrected," over-corrected in the sense of exact anatomical and physiological over-correction,—that is, such a position as will place the origin and insertion of the sterno-mastoid as far apart as possible. He leaves most of the treatment to the subsequent use of apparatus and passive motion, and most of the apparatus is inconvenient and comparatively complex. Exact anatomical and physiological correction of the deformity can be obtained in only one position of the head. Tillmanns uses less exact language than Hoffa, as will be seen by referring to his work, "Lehrbuch der speciellen Chirurgie." The "American Text-Book of Surgery" does not give much detail in its description of the treatment of this condition, and barely mentions after-treatment. König does not specially recommend particular attention to position of the head, but depends most upon the subsequent orthopædic treatment. I have quoted these authorities simply to show that among them there is a lack of detail in description which leaves something to be desired, and I have not pretended to exhaust the list of those who have written on the subject. Bradford and Lovett, in their "Orthopædic Surgery," give an unusually full description of after-treatment, and devote particular attention to the forms of apparatus. Most writers on the subject discuss very thoroughly the *remote* after-treatment, and give very little attention to *immediate* after-treatment in its orthopædic aspect. The treatment of the wound itself as a surgical question is insignificant.

Practically, all authors agree that the so-called open operation for the relief of torticollis is better, safer, and more exact than any subcutaneous section can be.

The plan which I carried out in the present case, and which gave a very excellent result, consisted simply in division through a short longitudinal incision, about two inches above the clavicle,

of the sterno-mastoid muscle and all tense bands of fascia, and then suture of the wound. A temporary heavy dressing with a rubber splint moulded to the proper shape was applied so as to get an approximate obliteration of the deformity, and recovery from anæsthesia waited for. When this had occurred, the rubber splint and most of the dressing was removed, and a new dressing with a plaster-of-Paris splint applied, with the head tilted as much as possible *away* from the side of the lesions with the face turned *towards* that side, and the chin pointing slightly *downward*. This position separates to the fullest possible extent the mastoid process and the sterno-clavicular articulation, and its maintenance is, of course, of great importance during the healing process. After ten days the dressing was changed, and a lighter plaster splint applied for another week, at the end of which period all dressings were discarded, and the patient discharged, to return for observation and manipulation. After about a month the case was lost sight of, and not seen again for a period of eighteen months. Then I was able to find the girl again, and saw on examination scarcely a sign of her previous deformity. In fact, the only remaining sign was a very slight asymmetry of the face. The movements of the head were normal in direction and extent, and the scar from the incision was almost invisible, even when looked for. I believe that a careful regard for the position of the head in such cases will obviate a good deal of subsequent orthopædic treatment by apparatus, and give better results in a shorter time than such orthopædic methods. The reason that recovery from anæsthesia was waited for before applying the permanent dressing was, of course, the fact that it is much easier to apply a dressing to a patient who is conscious than to one who is anæsthetized and limp. It is not, in my opinion, enough in the treatment of torticollis to apply an ordinary dressing with or without some arrangement of splint, with the head simply tilted away from the side of the lesion, and after healing has occurred, to depend upon massage and manipulation to complete the cure. We should devise some means of keeping the mastoid process, and the sterno-clavicular articulation as far apart as possible during the healing of the wound, and immediately after that pro-

cess is complete to the extent of a week or so. The material most readily adaptable to this purpose is plaster of Paris. My patient, though exhibiting the deformity in a high degree of development, had no form of apparatus but a splint of that material, and the result was exceedingly satisfactory. The amount of plaster used need not be great enough to make the splint cumbersome, but it will be found a good plan to arrange a column of thickening up the side of the dressing away from the side of the deformity. This will give much extra strength without adding much weight. Part of the thorax is, of course, included in the dressing.

The manipulations used in this case, after the dressings were discarded, were of the simplest kind, and consisted in movements of the head in appropriate directions with the hands of the operator, and even these movements were practised only a few times in the month during which the patient was under observation after operation. At no time was any orthopædic apparatus used beyond the plaster splint described, and this only during the period mentioned.

CASE OF STERNAL DISLOCATION OF SECOND AND THIRD COSTAL CARTILAGES AND OF CLAVICLE, WITH FRACTURE OF FOURTH AND FIFTH CARTILAGES.

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SURGEON TO THE PRESBYTERIAN HOSPITAL.

A MAN, thirty-five years of age, was admitted to the Presbyterian Hospital, February 21, 1895, who, in an attempt to jump onto the front platform of a slowly-moving horse-car, had slipped, and being caught between it and an iron pillar had been crushed and rolled between them, the space being six inches wide. The patient was a large man, his chest-measure being forty-two inches. He fell to the ground and the car was thrown off its track. For a minute or so he was stunned, and then rose, entered another car, and managed with great difficulty and suffering to ride to the hospital, the distance of a mile. On admission it was evident that his distress was very great. He was suffering from severe dyspnœa and was markedly cyanotic. Every respiratory movement caused intense pain. He had frequent cough with bloody sputum. He could not lie down, but sat up in bed. Pulse 140; temperature 100½° F.; respiration 48. Urine contained a trace of albumen and of sugar; specific gravity 1030. On examination there was subcutaneous emphysema of the neck and upper anterior part of the chest. On inspection it was seen that the clavicle and upper ribs were jammed backward. On passing the finger along the left border of the sternum it was found that the clavicle, second, third, fourth, fifth, and possibly the first ribs had lost their attachment to that bone and were dislocated backward and inward. The clavicle was displaced upward well above the top of the sternum and inward one and a half inches, where its sternal end pressed against the trachea. The second, third, fourth, and fifth ribs were displaced backward and inward, so that their sternal ends were situated oppo-

site the middle of the sternum (inward displacement one inch), and about two inches behind that bone. The exact position of the first rib could not be ascertained. The depression for the second and third ribs on the left border of the sternum could be distinctly felt, and it was evident that the costal cartilages of these two ribs had been dislocated from the sternum, and apparently were still attached to the ribs. The sternal facets for the attachment of the fourth and fifth ribs could not be felt, but in their place attached to the sternum was felt a projecting piece of cartilage about half an inch in length. It was evident that these two costal cartilages had been fractured near their middle, and one-half remained attached to the sternum, while apparently the other half remained on the end of the rib.

The sternal end of the clavicle was raised without much difficulty onto the anterior surface of the sternum. This gave marked relief. It was necessary to hold it in this position during the further manipulations, as it was easily displaced. Attempts were then made to spring the ribs into position. The shoulders were pulled back and the spine hyperextended, both by steady pressure and by jerks. These attempts caused pain and were only partially successful. The inward displacement could be reduced, but the backward could not be perfectly corrected, a displacement of half an inch still persisting in spite of the use of very great force. In order to keep the shoulders back, and thus reduce the deformity, various appliances and bandages were employed, but they all caused so much distress and so increased the cyanosis of the upper extremities that after repeated trials they were abandoned, and the patient was left sitting up in bed against a bed-rest with a pillow between his shoulders, and with the caution that he should keep them as far back as possible. He faithfully followed out the order, and he also found he was more comfortable in this position.

February 22. Distress and dyspnœa during the night had been great. Cough almost constant with bloody expectoration. Temperature 100° F.; pulse 130; respiration 24 to 36. Arms were tied behind, the pillow pressed into the hollow of his back.

February 23. Temperature 101° F.; pulse 124 to 140; respiration 46 to 56. Subcrepitant râles over left chest. Dyspnœa and cough severe.

February 24. Temperature 100½° to 102° F.; pulse 130 to 136. Delirious. Consolidation of entire left lung and effusion in pericardium.

February 25. Temperature 100° to 101° F.; pulse 120 to 130; respiration 34 to 44.

February 26. Dyspnœa less. Temperature 101° F.; pulse 124; respiration 32 to 40. Pericardial effusion diminished.

February 27. Temperature 100° F.; pulse 112; respiration 32 to 40. Less cough; more comfortable; lung clearing.

March 1. Steady improvement. Temperature 99° to 100° F.; pulse 110 to 120; respiration 30 to 36.

March 5. Temperature 99° F.; pulse 110; respiration 28. A broom-stick handle was placed through his elbows behind his back. Cough almost disappeared. Dyspnœa slight; appetite good; free from pain. Clavicle retains its position on anterior surface of sternum, and ribs remain displaced backward for a distance of one inch.

His pulse, temperature, and respiration soon sank to normal. He sat up night and day with the staff behind his back and through his elbows, which were bandaged to it. On March 8 he sat up in a chair. On March 23 he began to walk. On April 5 he was allowed to pass part of the day without the staff. The ribs and clavicle seemed firmly fastened in their new situation. There was no pain on manipulation of his chest. His general health was excellent. No cough. On April 6 he was discharged cured. On May 1 he was able to resume his work, and since that time has felt perfectly well. He suffers no pain, and would not know that he had been injured except when he attempts to lift a heavy weight, when he feels some weakness of the left side of chest.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, December 11, 1895.

The President, FRANK HARTLEY, M.D., in the Chair.

NEPHRECTOMY FOR ABSCESS OF KIDNEY.

DR. CHARLES MCBURNEY presented a male patient, seventeen years old, with the following history: Seven years ago hæmaturia was noticed. Four months later the same symptom returned, accompanied by pain in the penis and bladder. The patient was operated upon for vesical calculus by median lithotomy, but no calculus was found. The perineal wound remained open for two years, during which time two operations for its closure were done. The patient then entered a large hospital in this city, where five efforts were made to close the fistula, and finally suprapubic cystotomy was done. The perineal opening then closed, but the symptoms of vesical irritation were not relieved permanently.

When admitted to the Roosevelt Hospital, under Dr. McBurney's care, on October 18, 1895, the patient was emaciated and very anæmic, and complained of very frequent and painful micturition with the escape of pus from the urethra. The temperature was normal.

A considerable tumor was found in the right lumbar region, the tumor extending as far as the median line, and to a point one inch below the umbilicus. It was freely movable and not tender, and was apparently a much enlarged kidney. No history of signs pointing to symptoms of renal disease could be obtained. The diagnosis of suppurating kidney was made and nephrectomy determined upon.

This operation was performed on October 19. A curved lateral incision, about six inches long, following the lower border of the ribs, and about one inch below them, was made. All the layers of the abdominal wall were divided and the peritoneal cavity opened.

The outer layer of the mesocolon was incised and the colon and peritoneum being pushed inward, the whole kidney was uncovered. The ureter, much enlarged, was tied and divided, the pedicle including the vessels grasped with clamps, and the kidney removed.

The stump of the ureter was cauterized and fastened in the lower angle of the wound, about two-thirds of the wound, anteriorly, was closed with catgut, and the posterior portion packed with sterile gauze.

As a precautionary measure 1000 cubic centimetres of normal salt solution, hot, were infused in the left median basilic vein. The pelvis of the kidney was full of pus, and the kidney substance largely replaced by numerous abscesses, each one inch or more in diameter. No especial depression followed the operation, and the bladder symptoms immediately disappeared. The patient has made a complete recovery without incident, excepting that a small granulating surface is still open.

The case is presented to the Surgical Society to illustrate the importance, in cases of vesical irritation, of excluding the kidney as the primary cause, before applying operative or other treatment to the bladder.

The case also illustrates the completeness of cure which follows nephrectomy in suppurative disease of the kidney, as contrasted with the imperfect condition with chronic fistula, which is left after mere incision and drainage.

Dr. F. Tilden Brown said the kidney shown by Dr. McBurney looked very much like several which he had seen removed and which were tubercular in character, and he would be inclined to make that diagnosis in this case, notwithstanding the fact that the report of the pathologist seemed to be against it. The shell with its partitions which were left were of a bright cherry-amber color, and the compartments were filled with the broken-down portion of the pyramids, of a soft, cheesy consistency and yellowish hue.

Dr. McBurney stated that he believed the specimen presented by him to be a tubercular kidney. The gross appearances of this kidney were quite characteristic of tubercular degeneration.

Dr. Hartley mentioned a case with a history very much like that of Dr. McBurney's,—hæmaturia, pain in the penis, pyelonephritis. They were unable to make a positive diagnosis of the nature of the disease until the kidney had been removed through a modified König's incision, when it was found to be distinctly tubercular.

PERIVESICAL INFLAMMATION.

DR. L. W. HOTCHKISS read a paper on Chronic Perivesical Inflammation. (See page 140.)

DR. MCBURNEY remarked that if he understood correctly the case related by Dr. Hotchkiss, he would have felt like exposing the bladder and thoroughly packing around it with gauze, on the principle that we sometimes treated tuberculosis elsewhere, especially of the peritoneum. It was well known that in the latter locality tuberculosis sometimes subsided with wonderful rapidity after packing with gauze.

DR. HOTCHKISS said his object in operating in this case was to try to improve the condition of the bladder, so that finally it might be dilated, but the thickened and narrowed condition of the organ, along with poor blood-supply, made this impossible. In none of Haller's list of cases was there anything like the amount of perivesical and vesical thickening observed in his own, while in the former the origin was usually prostatic, and the posterior vesical tissue was involved more than the anterior.

Stated Meeting, January 8, 1896.

The President, FRANK HARTLEY, M.D., in the Chair.

CHOLECYSTOTOMY.

DR. CHARLES K. BRIDDON presented a woman, aged thirty-six years, who, one year before entering the Presbyterian Hospital, had been attacked by a pain situated immediately below the sternum, which lasted five days. September 13, 1895, having been attacked with sudden colicky pain in the region of the gall-bladder, she was admitted to the Medical Division. September 21, during her stay there, she had several attacks of colic, and became jaundiced. She was transferred to the surgical service October 14, and the abdomen was opened by a curvilinear incision eight inches long, one and a half inches below the border of the right ribs. On opening the peritoneum the right lobe of the liver presented. When this was drawn

up by an assistant, the gall-bladder was exposed; the omentum was adherent to its under surface; it was very much diminished in size, and its walls were thickened, but through them it was easy to distinguish a number of calculi; the cystic and common ducts were found empty; the gall-bladder was incised; five calculi were removed; the opening closed by a number of Lembert sutures; a tampon of gauze was placed down to this line of suture; the wound in the abdominal wall was closed with silkworm gut, except a space sufficient for the exit of the tampon.

The after-history was uneventful. There was no leakage of bile; the symptoms of cholæmia rapidly disappeared, and she was discharged, cured, in November.

CHOLEDOLITHECTOMY, SUPPLEMENTED BY CHOLECYSTENTEROSTOMY.

Dr. Briddon presented a second case, a woman, thirty-eight years old, who, in the midsummer of 1894, and again six months later, had had transient attacks of pain in the right hypochondrium. Two weeks before admission to the hospital, August 28, 1895, she experienced a more severe attack of pain, situated just below the sternum, coming on after meals, lasting one or two hours, and culminating in vomiting, followed two days later by jaundice with clay-colored stools and high-colored urine. Liver dulness increased, edge felt two inches below the costal border, and projecting from its under surface at a point opposite the tip of the tenth rib, and extending obliquely to a second point two inches below the level of the umbilicus, was an ovoid, elastic, movable tumor, which was manifestly the gall-bladder, and at times was quite tender.

Operation, September 18, 1895. A curvilinear incision of six inches along the free border of the right ribs. On exposing the liver there was found in the thin edge of its right lobe a circular patch, two inches in diameter, which appeared as if the secreting proper tissue had been absorbed and replaced by red granulation material. The gall-bladder was distended into a large sac, estimated to contain nearly a pint; its walls were of a light lemon color, and on removing the contents, which consisted of high-colored bile, they were found thickened, resembling very thick parchment; they had lost all their resiliency and elasticity, and instead of contracting simply collapsed. Before the trocar was introduced the enormously-dilated ducts could be readily traced upward to the transverse fissure,

and downward to the point where the common duct disappears behind the duodenum, but no calculus was found. The opening in the gall-bladder was temporarily clamped, and a vertical incision was made through the peritoneum immediately to the right of the second division of the gut. By blunt dissection with the finger the bowels were displaced to the left, when the finger came in contact with a stone situated in the duct close to its point of entrance into the intestine. A vertical section of the duct permitted the escape of the calculus, which measured one and a half inches in its largest circumference. A probe could not be passed into the gut, and the duct appeared to be so much damaged that it was thought probable that the natural process of repair would result in permanent obstruction, and it was considered prudent to make an anastomosis between the gall-bladder and the duodenum. This was readily done by means of a Murphy button; a tampon was introduced down to the opening in the duct, and the parietal wound was closed, except where the gauze passed. The convalescence of this patient was tardy; there never was any discharge of bile externally, and it is probable that the communication of the duct with the bowel was obliterated. She was discharged from the hospital November 19, two months after the operation. During all that time strict search was made for the button, but it failed to report. It will be remembered that the bladder was largely dilated with non-contractile walls. It is probable that it fell into that viscus, as the larger chamber, and that it there remains. It causes no inconvenience, and until it does so, there is no reason for interference.

Dr. Charles McBurney remarked as to the form of incision in operations upon the gall-bladder; that personally he preferred the vertical one. The circular and angular incisions inflicted more traumatism upon the tissues than was called for. Of course, there were exceptional cases in which the adhesions being wide spread, or an abscess being situated well back, or the patient being very fat, a supplementary incision became necessary. But ordinarily the vertical incision through the rectus muscle gave ready access to the gall-bladder and ducts. It healed primarily, the sheath did not tend to pull away, and he had been well satisfied with it. He would like to be informed whether there was any advantage in cutting the rectus muscle across some little distance which he had not yet appreciated.

Dr. Robert Abbe thought the vertical incision joined by a transverse one directly across the fibres of the rectus muscle, when

necessary to give freer access, gave better exposure of the bile-channels and made it easier to carry out the necessary manipulations than any other form of incision. As to mutilation of the abdominal wall, the scar was always a tight one in this upper portion of the abdomen, so that he had never seen a hernia. As was well known, the downward pressure of the viscera tended to hernia in the lower part of the abdomen, not in the upper. An incision on the outer side of the rectus muscle was more apt to produce a weak scar than one directly across the muscle. The ⅂-shaped incision gave ample room for cholecystenterostomy.

Dr. Briddon rejoined that Maurice H. Richardson had demonstrated that there was a point opposite the tip of the tenth rib and outer border of the rectus muscle, where the abdominal walls were composed of little more than integument and aponeurosis. Here an opening could be made an inch and a half long, sufficient to admit the finger and to enable one to form an idea of the size of the incision which the case would demand. He believed, with Dr. Abbe, that a transverse incision in the rectus was as harmless as any. He had never seen a ventral hernia follow an incision into the upper abdominal wall. He believed the curvilinear incision was the one now adopted nearly exclusively in Germany and by a good many English operators. As Dr. Abbe had stated, for a simple operation on the gall bladder a vertical incision might answer, but it gave scant room, and through it one had difficulty in determining precisely the extent of adhesions in these cases. Sometimes a mass of adhesions bound almost everything together, rendering it almost impossible to recognize the gall-bladder or anything else until ample room was obtained. In many cases, therefore, especially if the operation promised to be a prolonged one, he thought it best to make a pretty liberal incision at the beginning. He did not think it added much to the gravity of the operation; in fact, he doubted whether it added any, while it diminished the duration and the liability of injury to the viscera. He should be disinclined to give up the curvilinear incision or the transverse one recommended by Dr. Abbe.

He thought that it was unnecessary to make the incision, extending from the outer border of the rectus to the outer border of the quadratus lumborum, in order to secure drainage of the cavity below the larger lobe of the liver. In his experience gauze would drain this region if introduced through the incision ordinarily made, just as it would any other deep cavity. Any incision, curved or straight, if long enough, would give access to the parts.

ADENOMA OF THYROID GLAND; THYROIDECTOMY.

DR. BRIDDON presented a third case, in which the right half of the thyroid gland had been extirpated for adenoma.

The patient was a boy twelve years old; seven years ago he developed a cough, which has troubled him, off and on, up to the present time. In May, 1893, he was in the medical division of the Presbyterian Hospital for the treatment of chronic nephritis; he remained there for two months, at which time he was discharged, his urine containing no casts and only a trace of albumen.

Seven months ago a tumor developed in the right side of the neck; it was situated immediately to the right of the thyroid cartilage, was movable, and painless. In spite of treatment it continued to increase, until, on admission to the surgical service of the hospital, it presented as a large lobulated mass occupying principally the right side, but continuous with a smaller growth on the left side; the portion on the right side reached from the lower border of the mastoid process to the suprasternal notch, it was influenced by the movements of deglutition, and was evidently a hypertrophy of the thyroid.

December 4, 1895, an incision was made, reaching from the angle of the jaw above to the sternal notch below, parallel to the sterno-mastoid. Dissection was carried down to the surface of the tumor, the omohyoid, sterno-thyroid, and sterno-hyoid muscles being divided over the prominent part of the tumor. The tumor was enucleated at first above and internally down to the isthmus, then below inferiorly in the same way, being lifted out of its bed in front of the carotid sheath, the internal jugular and common carotid being exposed. This placed the inferior thyroid artery and vein upon the stretch, and they were tied as far externally as possible, the recurrent laryngeal nerve being seen passing to the groove between the trachea and œsophagus, and readily separated from the tumor. The superior thyroid was clamped and tied in the same way, and the isthmus was divided after the application of a ligature at the junction with the left half of the gland which was left to avoid the possibility of myxœdema. The wound in the integuments was closed by interrupted sutures, and union *per primum* obtained in nearly the whole extent of the wound.

THE DIAGNOSIS AND TREATMENT OF SURGICAL RENAL DISEASE.

DR. HOWARD LILIENTHAL read a paper with this title (see p. 257).

DR. ROBERT ABBE said that, of course, most of the cases of sar-

coma of kidney do recur, but the outlook for the operation is certainly better now than ever before. The two cases shown by him to this society last year are still well, the operations having been done four years ago.

One point of interest brought out in the paper is the disappearance of cachexia after operation. This happens often in cancerous cases, but notably so in sarcoma. These children are not only anæmic, but they have a cachexia which is distinguished from cancer cachexia. The complexion is greenish rather than of the earthy look of cancer. This disappears after operation, and the children acquire not only a good complexion, but become fat and in every way perfectly sound and healthy.

The Trendelenburg position makes this operation a comparatively simple one. He believed there was little need of grave hæmorrhage if this position was maintained; the tumor shells out rapidly, and the pedicle is either ligated or clamped. The clamp is an effectual instrument when there is any question of speedily securing the vessels or risk in tearing off the pedicle or of prolonging the operation unduly. Applying a clamp as in vaginal hysterectomy should make it uniformly a quick and safe operation.

The third case is a triumph, because it belongs to a class of cases which are so uniformly fatal. This is true not only of multiple pyæmic abscess of the kidney, but also of the liver, which has been considered as practically inoperable. He saw no reason why, however, a series of hepatic abscesses of pyæmic origin might not also be operated upon if cases of multiple renal abscess can be saved, as in this instance. When the surgeon sees a case hopelessly fading under his hands he was inclined to agree with Dr. Lilienthal, that it was his duty to operate. The risk of the operation is slight as compared with the inevitably fatal ending without it.

Dr. Lilienthal, in reply to a question, stated that in the case of metastatic abscesses of the kidneys, he thought it probable they were both involved at the same time. The first kidney was, no doubt, infected from the septic jaw, and as this form of nephritic abscess was nearly always double, he did not doubt but what both kidneys were involved at the time of the first operation.

Dr. McBurney said, supposing one could make a diagnosis, as one can in some instances, of multiple abscess of one kidney, would it not be wiser to remove that kidney entire and put an end to the disease, taking no risk of further septic process? It seemed so to him;

of course, there could be many cases in which there would be contra-indications, but suppose there were no contraindications, would it not be wiser to take out the whole kidney than to leave it to completely break down, as it almost certainly would do? He had been much pleased with the result of operation in some cases of that character. In one case the kidney abscesses originated from disease of the genito-urinary tract. It was a long-continued case in which sepsis began in the prostate following gonorrhœa. The chronic condition of the prostate gave rise to sudden onset of symptoms pointing to septic infection of the left kidney. The high temperature, pain, condition of urine, all pointed to involvement of the kidney, and he advised that the kidney be removed at once, since the right kidney was apparently absolutely sound. This he did on the third day after the commencement of symptoms pointing to its infection. The patient made a perfect recovery and has been healthy since. Section of the kidney showed commencing multiple abscess, the individual abscesses, half a dozen in number, being not larger than No. 3 shot. No incision with the kidney *in situ* could have reached these abscesses, and anything in the form of curetting would have been only a partial attack upon the disease.

A few days since he had operated upon a patient whose kidney-disease originated from an attack of gonorrhœa. The gonorrhœa had begun eight weeks before and had practically terminated at the end of six weeks. After a few days of entire health he had a sudden rise of temperature, with pain in the left lumbar region, indicating trouble with the left kidney. There was high temperature, rapid pulse, great pain, tumor at the site of the left kidney. Being well satisfied that suppuration was going on in the kidney he cut down and opened a large abscess, containing six or eight ounces of pus. The symptoms were relieved at once. The patient continued well a week, then the temperature began to rise again, showing a septic chart. He forthwith extirpated the entire kidney, which, on examination, was found to contain the collapsed sac which had previously been opened, and also, in various directions, multiple abscesses. No incision into the kidney substance nor any curettement could have met the indications of this case. The moment the operation was done the temperature became normal and remained so. This experience only coincides with the conclusions reached by surgeons with regard to suppurating tissues in other parts of the body. His feeling was very strongly in favor of extirpating all tissue from every region

of the body which is the seat of multiple abscess, if it is possible. While all over the world nephrotomies for suppuration of the kidney are being done,—he had done many of them himself,—he had not seen any statements which were satisfactory in regard to the ultimate results of such operations. Cases of nephrotomy for suppuration of the kidney do not often get well, so far as he knew, unless after a long period. Some go on to further abscess and disease of the other side; a large number continue with permanent sinus; others die. He thought, therefore, the question an important one as to choice between incision and extirpation. Of course, there are cases which exclude extirpation.

DR. F. TILDEN BROWN remarked that according to the limited studies which he had made in the autopsy-room at the Presbyterian Hospital and elsewhere, during the last year and a half, it is much more common to find renal infection which has taken place through the blood than to find the ascending form.

DR. ANDREW J. MCCOSH was inclined to agree with the general rule stated by Dr. McBurney regarding extirpation of suppurating kidneys. This rule, however, has exceptions. About two years ago a young man came under his care who had been sick for several weeks just after graduating in medicine. When he saw him the temperature varied from 102° to 104° F., pulse, 120 to 130, intense pain in the right loin. A posterior incision was made and a perinephritic abscess was opened, the kidney was exposed with a good deal of difficulty, and two cortical abscesses were opened, each one containing about an ounce of foul pus. The urine had been repeatedly examined carefully, and neither albumen, blood, nor pus had been found. The cause of the abscesses was apparently either measles or grippe, for he had had an attack of measles in January and an attack of grippe in March. The operation was done in June. The kidney has apparently healed, the patient is now in excellent health and serving on the house-staff of one of the city hospitals. If his condition at the time of the operation had been good, he should perhaps have considered the propriety of nephrectomy, but if this had been attempted he would have died on the operating table. As it has turned out, it is well the kidney was not extirpated; still, he believed this to be one of the exceptional cases, and that usually the kidney should be removed when it has become infected as the result of a general pyæmic process. He did not consider that this rule applied to kidneys which have become infected from extension of sepsis upward from bladder or urethra.

Dr. George Woolsey mentioned a case which he had operated upon the previous winter. A prior operation, the nature of which he did not know, had left a fistula in the lumbar region. There were no casts, albumen, or other evidences of renal disease in the urine. Yet when he cut down he found the kidney extensively involved by multiple foci of long standing. The pelvis of the organ was not diseased. The kidney being extirpated, the patient made a good recovery. It was the first of two cases of kidney abscess which he had seen within a year with absence of urinary signs. The last one was probably due to occlusion of the ureter, as there was a large sac filled with pus which represented the kidney.

Dr. Lilienthal remarked that the cases related by Dr. McBurney were cases of ascending infection unquestionably. He had not referred to this class of cases in his paper, having purposely excluded them. His point was simply that when the infection of the kidney takes place through the blood-current, and when there are no urinary symptoms, it is wrong to extirpate the organ instead of giving the patient a chance by very thorough nephrotomy. When the pelvis of the kidney is involved the whole aspect of the case is different, even though the original process was from the blood-current. In this event, if the disease is unilateral, the kidney had better come out. If, however, the other kidney is also involved by multiple abscesses, as is likely to be the case, he thought the removal of one kidney, or any healthy part of it, to be a dangerous procedure, for one does not know how soon the other kidney, already diseased, may give out and cause the patient's death. Pyæmic kidneys ought not to be taken out unless there is very good reason for it, while others ought to be taken out as soon as it has been proven that they are pretty well destroyed by suppuration.

ANASTOMOSIS OF COLON AFTER EXTIRPATION OF CANCER.

Dr. L. W. Hotchkiss presented two specimens, the first having been removed by operation December 19, the other by autopsy a week later, illustrating adeno-carcinoma of the sigmoid flexure of the colon. After removing the diseased portion, anastomosis was performed after the manner devised by Maunsel, invaginating the smaller into the larger end. The operation itself was easily accomplished. There had been complete obstruction of the bowel for nine days, and

the pressure which had been exerted upon the upper portion of the gut during this time had left it so thick and soft that the edge of the gut was torn while making traction upon the sutures, and this led to some leakage during the operation. Before completing the operation, however, everything had been made secure, so that no further leakage took place even during a severe paroxysm of coughing. He packed gauze around the softer upper portion of gut where leakage had taken place, entirely isolating it, in order to avoid possible subsequent trouble. The patient did well until the end of the third day, when he passed some fæcal matter into the wound. The temperature then went up, and, in spite of the fact that the wound was easily kept free of fæcal matter, he died on the seventh day of sepsis. The autopsy, which was partial, revealed the fact that the enterorrhaphy was competent. The leakage had occurred apparently through a small wound in the upper portion of the gut, which was rotten and infiltrated with pus. Apparently it had been too much pressed upon during the nine days previous to the operation to recover its integrity, and the patient had been hopelessly infected from the first. There was no infection of the general cavity, no extension of peritonitis. The patient had had several fæcal movements before death.

Dr. Hartley showed a specimen from a case in which he had performed Maunsell's operation about three years before upon a patient who had circular epithelioma of the large intestine, invagination, with symptoms of obstruction, numerous large scybala above the obstruction. Maunsell's operation seemed particularly applicable, since it was one which called for invagination, and this was already present, and it was preferable to circular enterorrhaphy or anastomosis by Murphy's buttons, as injury was less likely to result on passage of the large fæcal scybala, which must soon take place after the operation. In reality the fæcal masses did pass within forty-eight hours and caused no injury to the entire line. The operation lasted thirty-five minutes. It was to this class of cases that he thought the operation was especially adapted.

Dr. Abbe said, with regard to the use of gauze in intestinal surgery, that if the operator was convinced he had done his suture work properly in clean peritoneal cases, he invalidated the result by walling about the sutured part with iodoform gauze with a view to providing a channel for possible fistula. The gauze, when placed against the sutured bowel, drains away lymph which was reparative and necessary to seal the suture. Being satisfied that his work had been done

properly, the operator should return the gut into the abdomen, and the lymph would soon bury the suture and strengthen the wound. As long as iodoform gauze remained in contact, it detracted somewhat from the chances of solid healing, and fæcal fistula was much more apt to occur when the lymph-saturated gauze was taken away. He believed, therefore, that if the operator was satisfied with his work, it was better not to pack in iodoform gauze upon it, but to drop the sutured intestine back, where it would come in contact with normal peritoneal surfaces, and retain all the exudate poured out by nature to reinforce the sutures and such additional lymph as might come from adjacent parts.

DR. MCBURNEY had no criticism to offer upon the use of gauze in Dr. Hotchkiss's case, but he agreed with Dr. Abbe, that to restore the parts to their normal position and close the wound was very desirable in all cases of intestinal anastomosis, where there was no special indication for the use of gauze. But Dr. Abbe's statement that the packing interfered with union by draining away lymph, was not, Dr. McBurney thought, supported by experience. Take, for instance, cases of appendicitis in which it was desirable to introduce considerable packing; it was seen, when the packing was withdrawn, that the parts were firmly glued together, so that considerable force might be used in removing the packing without separating the adhesions. But while he thought the introduction of gauze stimulated the peritoneum to a high degree, favoring the formation of lymph tissue, still, he did not think it was a good thing to use in intestinal anastomosis. In some cases, like the one reported by Dr. Hotchkiss, the gauze is a safeguard. In most cases the operation can be made so perfect that drainage is unnecessary, and its use renders wound-healing much less perfect.

TRANSACTIONS OF THE SECTION ON GENERAL SURGERY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA.

Stated Meeting, November 8, 1895.

DR. OSCAR H. ALLIS, President, in the Chair.

PEDUNCULATED MYXOMA OF THE ABDOMINAL CAVITY.

DR. JOHN B. ROBERTS reported the following case: Two years ago, while operating for the radical cure of a very large umbilical hernia in a woman, he discovered among the contents of the large hernial sac a small translucent body the size of a pea. It was not attached to the surrounding intestines in the sac, but had a long pedicle descending into the abdomen. By pulling upon the tumor he drew from the abdominal wound a foot or more of the pedicle, which was not thicker than a stout thread and perfectly translucent. The attachment of this pedicle was evidently some distance below the opening made in the abdominal wall, but he could not determine its attachment without causing more disturbance of the abdominal contents than seemed proper, and he was afraid to continue traction lest he should break the slender stalk of the polypoid growth and have bleeding from the hidden stump. He therefore contented himself with tying the thread-like pedicle, and excising the tumor with a short piece of the pedicle. The rest of the pedicle was allowed to fall back into the abdomen. The patient, who had an enlarged and dislocated spleen in addition to the hernia, died, and an autopsy was made. The point of attachment of the pedunculated growth was, however, not determined.

The tumor was examined by Dr. W. M. L. Coplin, who furnished the following report:

"The mass is pea-shaped in outline, with smooth and regular margin. It measures nearly one-half inch in its longest diameter and a trifle over one-fourth of an inch in its shortest diameter. The attached pedicle is one and three-eighths inches in length. The mass is semitranslucent and gelatinous. Under the microscope, the structure is that of a myxoma, containing very little fibrous stroma. It is covered by endothelium, most of the cells being flattened, although a few are more rounded in contour. The pedicle contains a single artery and vein, but no nerve-fibre can be demonstrated as present."

Dr. Roberts said that he reported the case because pediculated peritoneal tumors are quite rare. Masses without any pedicles are also, though rarely, found in the abdominal cavity. These appear to have been developed as pediculated growths, and have finally become separated from their original point of attachment.

About a year ago Dr. David Riesman recorded in the *University Medical Magazine* an instance of small angio-lipoma, which he found hanging by a pedicle from the transverse colon in making an autopsy upon a case of pyloric cancer. He refers to a number of instances of stalked tumors occurring in the abdominal cavity. The bibliography connected with his article will be found very valuable.

DERMOID CYST IN THE ABDOMINAL WALL OF A MAN.

Dr. William J. Taylor related the following case: A man, aged twenty-two years, was admitted to St. Agnes's Hospital, April 25, 1895, having, four weeks before, first noticed a small mass in the middle line of the abdomen, directly below the umbilicus, which had gradually increased in size till it was that of an egg, and was hard and tender to the touch.

He stated that there had been some purulent discharge from the umbilicus, but none was detected while he was in the hospital.

As the growth was increasing rapidly in size and becoming very painful, he was placed under the influence of ether, and an incision made over the swelling directly in the middle line of the abdomen and about an ounce of foul-smelling pus evacuated. Upon careful examination it was found a probe could be passed through the umbilicus into the abscess cavity, and at the bottom of the cavity and communicating with it a depression was found which contained a small amount of material such as is commonly found in dermoid cysts; this was softened, cheesy, and contained a small amount of hair.

A small dermoid cyst evidently had existed in the abdominal wall, connected with the umbilicus by a small opening, and was thus the starting-point of an abscess immediately overlying it in the abdominal wall. No connection with the peritoneal cavity could be detected, and the growth was strictly limited to the abdominal wall. The abscess and the cyst were freely curetted, the whole of the umbilicus dissected away, and after most thorough disinfection a strip of iodoform gauze was introduced for drainage and the wound closed. Recovery was prompt and in every way satisfactory.

Dr. Taylor further remarked that dermoid cysts of the abdominal wall are extremely rare. In looking up the subject, he had found recorded only a very few cases. According to Bland Sutton's classification they are "sequestration dermoids," and occur strictly in regions where the lateral halves of the body coalesce. "This line of union, commencing immediately below the occipital protuberance, extends along the middle of the back to the coccyx; it then passes through the perineum (scrotum and penis in the male) and upward through the umbilicus, thorax, neck, and chin, to terminate at the margin of the lower lip." It is possible for a dermoid cyst to form at any point along this line.

Dr. A. G. R. Fullerton (*Illustrated Medical News*, September, 1889, p. 261) reports the case of a man, aged forty-nine years, with a similar growth, which was rounded, about the size of a cherry, and with a mucous-membrane-like covering. The parts were constricted, but there was no pedicle, and around the growth there was a zone of uniform induration one and a half inches in every direction, involving the skin and subcutaneous tissue. He had first noticed this three weeks before he applied to Dr. Fullerton, and the diagnosis of cancer had been made by another physician. The growth was removed, the cavity beneath the skin, which contained sebaceous matter and pus, the former the size of a cherry, was carefully scraped out, and the man made a good recovery.

Of course, it was possible that this was one of simple sebaceous cyst occurring in this region.

In the *Lancet* of July 7, 1888, p. 16, Dr. Fullerton reports four other cases of sebaceous matter in the umbilicus causing suppuration in the abdominal wall. These all contained sebaceous matter and hair, which he attributes to unclean habits, but from the account which he gives of the cases they resemble much more broken down dermoid cysts.

F. R. Walters (*Lancet*, 1893, Vol. 1, p. 173) reports the case of a man, aged thirty-four years, who had periodic attacks of slight stomachache followed in every instance by a discharge of matter from the umbilicus. He had been told there was a slight rupture at the navel. Careful examination revealed a patent umbilicus, with a skin pocket which contained a yellow mass, and which the patient stated had been there for years. The mass was readily detached by a little careful probing, and proved to be pus with matted hair and sebaceous material, which rested in a pocket which was two inches in diameter with a half-inch opening, and was three-quarters of an inch deep. There was no hernia. The patient was very cleanly in his habits, but took a great deal of exercise, and it was, therefore, supposed the hairs were derived from a belt of flannel which he constantly wore around his waist.

It would seem, however, that this was also a dermoid cyst communicating with the umbilicus.

PELVIC ABSCESS DUE TO APPENDICITIS DRAINED THROUGH THE RECTUM.

DR. OSCAR H. ALLIS read a paper with this title. (See page 272.)

DR. JOHN B. ROBERTS remarked that undoubtedly neither Dr. Allis nor any other member of the section would advocate waiting until such a large collection of pus had formed; but it may be well when a large abscess has formed to open it in the rectum, especially where the case has to be left in the hands of others who are without special surgical training. There is, of course, the possibility of the abscess becoming foul, owing to infection from the bowel.

DR. JOHN C. DA COSTA called attention to the point that, in opening an abscess through the rectum, if it is not opened at its most dependent part, it is possible that fæcal matter may enter into the abscess and the surgeon be compelled to open the abdomen eventually before the patient will get well.

In the case of a woman he could not see the advantage of the rectal route over the vaginal, which affords better drainage.

DR. ALLIS replied that as regards evacuation through the rectum, he did it in his first case with fear on account of the danger of getting fæcal matter into the abscess cavity, and was conscious that it was a surgical procedure of doubtful propriety. But the abscess was within reach of the second joint of his finger, was full almost to bursting;

so he opened it on general principles, thinking he was following the lead of nature. No after-treatment was needed. The patient's general condition and appetite improved immediately. A few days later she was allowed out of bed, and soon was perfectly well. Shortly afterwards he was emboldened to do this operation on a second case. This was a case in which the pus cavity did not extend down so far, though in easy reach of the finger. The abscess filled the outlets of the pelvis. He might have incised two of these cases by the vagina, but he did not know that the vagina was less infectious than the rectum. The pus was intensely offensive. He could not imagine a more infectious pus than was in the abscesses in these three cases. He did not defend the operation as one of a high grade of scientific surgery; but all the cases got perfectly well, and this is better than to have a scientific operation where the patient dies.

GASTROSTOMY FOR IMPERMEABLE MALIGNANT ŒSOPHAGEAL STRICTURE.

Dr. Edward Martin presented a patient, upon whom he had done gastrostomy, the history of whose case was as follows: A woman, aged seventy-three years, coming from healthy parents and giving no history of œsophageal trauma, noticed towards the latter part of January that there was some difficulty in swallowing, and that at times food would regurgitate. These symptoms became slowly but progressively more distressing till August 31, when she was admitted to St. Agnes's Hospital. At that time she was greatly emaciated and apparently regurgitated everything taken, not immediately after deglutition, but in the course of one or two hours, the œsophageal dilatation on the proximal side of the stricture apparently holding about four ounces.

An examination under ether showed a stricture twelve and a half inches from the incisor teeth, admitting after prolonged effort a soft rat-tailed bougie, No. 16 F. This instrument was grasped tightly. Because of the patient's age (seventy-three) and the absence of traumatism, the case was diagnosed as one of malignant disease. Dilatation with soft instruments was advised. It was, however, not practicable to introduce these, and after a few weeks of partial relief to the obstruction symptoms, the patient again returned to the hospital for further intervention. Ether was again administered and an effort made to introduce a small instrument. Even a ureteral catheter

failed to pass. Gastrostomy after Frank's method was then performed. A two-inch incision was made through the abdominal parietes parallel to the left costal margin and half an inch to the inner side, the upper extremity of this incision being placed a little above the lower margin of the left lobe of the liver; the stomach, although contracted and out of sight, was readily found, was drawn into the wound, and through its outer two coats was passed a stout silk thread, the long free ends of which were knotted, thus serving as a ready means of drawing the included portion of the stomach wall in any desired position. A second incision was made parallel to the first, one inch long and one inch above and to the outer side of the left costal margin. This incision was carried down to the ribs; the bridge of tissue separating the two wounds, made up of skin and fascia, was lifted by blunt dissection; the silk loop which secured the stomach wall was passed beneath this bridge and through the upper wound, when by traction the stomach wall was itself made to follow. A few interrupted sutures secured the parietal peritoneum to that of the stomach; the first wound was closed, the peritoneum of the projecting portion of the stomach was sutured to the entire periphery of the upper wound, the stomach was then opened, and a small catheter inserted.

The patient exhibited no shock, and was fed in six hours. Her wounds ran a clean course. She has gained rapidly in weight and strength.

No strenuous effort to treat the stricture directly was made in this case because it was believed to be malignant and unreachable for radical cure. A cancer so extensive or so placed that complete removal is impossible should be spared every cause of congestion; the avoidance of teasing efforts at catheterization, and particularly the physiological rest ensuing from the doing away with the necessity for swallowing, should in this case make the rate of growth less rapid, even if it gives no hope of permanent cure.

As to the operation of gastrostomy, a number of ingenious procedures have been suggested. The most commonly practised is probably that found described in the text-books of surgery and of operative surgery. In this the belly is opened immediately over the stomach, the parietal peritoneum is stitched to the skin, the unopened stomach is fastened to the wound by sutures transfixing the abdominal walls, and all but the mucous coat of the stomach. The stomach is opened six or seven days later. This is a simple operation, but is open to

the objections that it is unsafe to open the stomach before adhesive inflammation has shut off the peritoneal cavity, hence patients cannot be immediately fed, although sometimes their condition is such as to demand it, and particularly that the fistula thus formed constantly leaks, keeping the surroundings in a highly inflammatory state. To obviate this latter complication Witzel has described an extremely ingenious and very successful procedure. This consists in making the customary incision, splitting the rectus along the course of its fibres, pulling a portion of the stomach wall as large as the palm of the hand out through the wound, opening the stomach at a spot near the lesser curvature, passing one end of a two-foot red rubber tubing through this opening, the tube being of such size that the incision is plugged by it, raising a fold of stomach on each side of the rubber tube, and securing these two folds together by continuous Lembert sutures, thus burying the tube for about two inches of its length. This first line of suture is reinforced by a second line. The stomach is secured to the parietal opening, and finally the latter is closed, the rubber tube passing out through it. This operation seems effectually to stop leakage, and on removal of the tube the fistula rapidly closes. It is more elaborate than Frank's method, and no more successful. Indeed, it seems clear that Frank's method of gastrostomy is the simplest, the most easily and rapidly performed, the most efficient and the safest operation yet proposed. It is also to be further commended, since, should it become desirable to close the fistula, this can be done extraperitoneally, the opening in the stomach wall first being closed, the stomach wall then being dissected from its adhesions to the soft part and returned to the abdominal cavity.

In view of the advantages offered by this operation, it would seem advisable to perform it in every case of inaccessible œsophageal cancer as soon as obstructive symptoms become manifest, rather than to have recourse to the use of bougies. Dr. Martin believed that this operation is safer even than the passage of bougies, at least he knew of two cases in which an attempt to pass an instrument through an œsophageal stricture had resulted in instant death, and there was a third case where, after an apparently successful passage of a catheter and injection through this of food, the patient perished shortly of septic peritonitis, found to be due to extravasation of the food into the peritoneal cavity.

EXTIRPATION OF CARCINOMA OF THE UPPER JAW.

DR. MARTIN presented a man, forty-nine years of age, from whom he had recently removed the right superior maxilla for carcinoma. The patient was able to be out of bed and walking about the wards on the second day, and had had an uneventful convalescence. In connection with this case he discussed the technique of such operations, and concluded by emphasizing the following points connected therewith:

(1) Plugging of the nostril of the affected side from behind.

(2) Carrying the incision first through the lip, then around the alæ of the nose, securing by hæmostatic forceps each vessel as it spurts, then rapidly completing the incision to the inner angle of the eye and outward along the lower border of the orbit, dissecting up the flap as quickly as possible and relying upon sponge-pressure to check hæmorrhage until this flap is dissected completely back, then applying the forceps to the bleeding points.

(3) All other bony attachments to be divided before the palatal process is opened through, and this part of the operation to be accomplished as rapidly as possible with a strong, narrow, large-handled saw. During this part of the operation the patient to be drawn to the end of the table with the head hanging so that the vertex is directed downward.

(4) The head to be elevated again as soon as the bone is removed.

(5) In case of malignant growth the actual cautery to be applied thoroughly to all raw surfaces in the neighborhood of such growth.

(6) The wound to be closed by interrupted buried catgut sutures and a continuous horse-hair skin suture, the latter to be removed in twenty-four hours.

(7) In the further treatment, reliance to be placed upon frequent cleansing rather than upon packing.

RADICAL CURE OF CONGENITAL INGUINAL HERNIA.

DR. MARTIN presented a man, twenty years of age, upon whom he had recently operated for the cure of an oblique inguinal hernia, complicated with an hydrocele of the cord.

The customary incision was made and the hernia was exposed. The sac was separated from the cord only after prolonged dissection,

this structure being spread out on the posterior portion of the peritoneal pouch and most intimately blended with it. The sac was finally completely freed, was drawn well down, was doubly transfixed, and was tied.

This transfixion is an important part of the operation, as it lessens the chance of the ligature slipping. This accident happened to him once when performing Bassini's operation for the radical cure of femoral hernia, the catching up of the retracted peritoneum and securing by suture was more troublesome than all the rest of the operation. In the present case the fibres of the external oblique and transversalis were cut upward and outward, the cord brought out through this opening, and the inguinal canal was closed by four wire-mattress sutures.

The hydrocele sac was then dissected out. It also was intimately blended with the structures of the cord, and at one time communicated with the main hernial sac, but was evidently shut off by adhesive inflammation.

LEONTIASIS OR HYPEROSTOSIS OF THE BONES OF THE FACE.

Dr. John B. Roberts presented a woman, twenty-two years old, who had been referred to him by Dr. B. R. Lee. When she was six years old her mother noticed a swelling at one side of her nose. Subsequently a similar swelling was noticed on the other side of the nose. About three years ago she herself noticed a swelling on the right side of her lower jaw between the angle and the chin. This swelling she thought was due to a decayed tooth, the root of which she says is still in the jaw. The gum, however, on inspection, shows no special evidence of a diseased tooth beneath it. There is an absence of one tooth in this region. A similar swelling of the left side of the jaw made its appearance a year or two ago. She has on this side a small opening in the gum at a point where a tooth is absent. This probably leads to an unextracted root.

As long as she can remember, her nose has been stopped up on both sides. About ten years ago she had her nose operated on, but does not know what was done, but was told it was for polypi. No improvement followed the operation. The patient has good general health. Her digestion and bowels are normal. Menses are regular. She has no cough. There is no enlargement of thyroid

glands. No evidence of syphilis, and no bony growths except on the face.

On the right side of the nose, in a line almost parallel with, but a little above, the naso-labial furrow, is a mass of bone which extends upward almost to the middle line of the nose and runs obliquely downward for about an inch and a half. The soft parts are elevated by the underlying bone, making the deformity quite conspicuous. The osseous growth terminates below, as it does at its upper end, in a sharply-defined edge which can be felt when pressure is made upon the soft parts. The width of the elevation is perhaps half an inch. On the opposite side of the nose is a bony elevation of a symmetrical character lying in the same situation and with its long diameter felt and seen in the same direction. It is less developed than the one on the right side. Pressure over the middle line of the nose shows that neither growth comes quite to the middle line, as there is a slight furrow between them which evidently is the surface of the nasal bones.

On the right side of the lower jaw, beginning a little to the right of the chin, is a smooth bony swelling extending not quite back to the angle of the jaw. This growth involves the lower margin of the horizontal portion of the jaw as well as the anterior surface, and extends up to the alveolar process; as is shown by looking into the mouth where the mucous membrane is raised by the bony swelling. The tumor is smooth in outline and gives the lower part of the face a very square appearance because of its prominence forward.

An identical growth is present on the left side of the jaw involving in a similar manner the lower margin and the anterior surface of the ramus. It is in a similar manner visible when the lower lip is everted. The jaw at the point of greatest development of the symmetrical tumors is about an inch thick, as is shown by putting the forefinger in the mouth and the thumb upon the external surface. The growths on the left side of the face are smaller than those on the right side.

The other bones of the mouth and face do not seem to be altered. There is no enlargement of the cranial bones and no lymphatic involvement of the glands of the neck. The roof of the mouth shows a rather deep arch. An attempt to pass a finger into the posterior nares behind the soft palate showed very little space between the velum and the posterior pharyngeal wall. It seemed as

if the vertebral column at this point was rather prominent in the middle line as though there was some bulging growth in this region.

An examination of the nose showed both nostrils to be occluded. The mucous membrane looks whitish, probably from pressure put upon it by the underlying bony growth. When she sniffs she can *sometimes* draw a little air through the left nostril with a whistling noise. She cannot blow out through her nose at all; nor can she always draw air in by this sniffing action. The occlusion is due to a continuation of the bony growth felt upon the outside of the nose.

DR. SOLOMON SOLIS-COHEN, having examined the posterior nares, reported that he found the posterior nares to be almost normal. There is a slight enlargement of the turbinate of the right side posteriorly, but nothing comparable to the anterior enlargements, which are probably of the maxillary bone. The projection of the posterior wall of the pharynx does not extend far beyond the overhanging margin of the soft palate, a fact readily determined by the insertion of the finger. The larynx is normal. Her vision is practically normal in both eyes.

DR. ROBERTS also presented a case exhibiting an hyperostosis of the cranium of nine years' duration.

The woman, who was twenty-one years old, had had a swelling at the side of the head a little in front of and above the right ear, since she was twelve years old. It had slowly increased in size. Before she was twelve years of age, there was some swelling in the same region, when she had headache; this disappeared, however, when the headache was relieved. She says that headaches were frequent during her childhood, and the swelling which came disappeared as above stated during the intervals. This account she has received from her parents, and does not remember the exact circumstances herself. She says she was brought home from school at times, after having "fainted," because of the severe pain in the head and nausea; she had no vomiting. The pain was principally felt on the top of the head, but extended somewhat down the back. When a child she felt a throbbing at times in the swelling.

Of late years the swelling, which has been permanent since the age of twelve, has gradually increased in size, and her headaches have become more severe. The pain is principally on top of the head and never is in the swelling. It is reflected, however, to the

back and front of head. She has headache practically every day. The pain sometimes keeps her from sleeping. Ordinarily she sleeps very well.

The swelling has increased recently, though rather slowly; and the headaches have increased in intensity. The nausea is not so marked now as it was a few years ago. She has never vomited with the headache. There has been no history of epileptiform seizures; though she "fainted" at school at times when she was young. There is no recollection in the mind of her mother of any injury.

The patient presents no appearances to make one think of a diagnosis of hereditary or acquired syphilis. She has no other bony growths than that of the head. She is not deaf. There is no enlargement of the thyroid gland. The swelling begins about two inches above the auricle, extends forward to a point about half-way between the auricle and the outer canthus of the eye. Its lower margin is a little above the tragus. The posterior margin is about half an inch behind the cartilaginous portion of the concha. The length longitudinally is about two and a half inches; the vertical diameter about two inches.

The bulging of the side of the head seems rather general, but the outlines of the most prominent portion of the bony protuberance can be felt with the fingers at the points mentioned as a ridge rising rather abruptly from the surrounding cranial bones. The patient has a rather square head and face, but there is no protuberance on the other side or elsewhere. The zygomatic region seems to be fuller on the side of the head upon which the swelling is situated, as though the zygomatic fossæ were encroached upon. The width of the head as seen from the top is rather unusual for a woman of the size of the patient. From the top of one auricle to the top of the other auricle, measured across the vertex, is twelve and a quarter inches. Her height is five feet one inch, scant.

Her eyes were corrected for ametropia about seven months ago, and she has worn glasses constantly ever since, but no relief to the headache has been given. She has no exophthalmus and her vision with her optical correction is good. She has some pain in the sacral region.

As the patient is viewed from in front, there seems to be a general bulging of the right side of the head from the malar bone up to the lower temporal region, extending obliquely backward. The patient had been under Dr. Roberts's observation for nearly a year,

during which time no special change in her appearance had taken place.

Treatment has been ineffectual in alleviating pain; and the headaches have increased in severity. She is quite frequently unable to attend to her work because of the pain in her head. Bromides have been unavailing.

Dr. Roberts believed the swelling to be due to an overgrowth of bone and had advised operation for the relief of the headache. It is possible that a simple splitting of the periosteum or of the temporal fascia would lessen the headache by relieving the pressure caused by the development of bone underneath these fibrous membranes. It seems to be a little curious that the pain is not felt in the region of the tumor.

Hyperostosis of the cranium or of the face is a rare disease and has interested pathologists and neurologists not a little. Some writers have expressed a belief in the possibility of the condition being analogous to myxœdema and acromegaly; though others have looked upon the bony growths as of inflammatory origin. Intracranial pressure may become marked from the thickened bone encroaching on the cranial cavity.

At the last meeting of the American Neurological Association, Dr. J. J. Putnam reported cases of this disease, which are full of interest.

Horsley reports in the *Practitioner*, July, 1895, several cases upon which he has operated and cut away, with saw, gouge, or trephine, the bony growths. He found the tumors to have a smooth surface covered with thickened periosteum, and that the bone on section showed an abnormal vascularity which enabled him to easily distinguish the pathological bony tissue from the adjacent healthy structure.

Removal was easily accomplished without special bleeding. The dura mater was, in some instances, exposed in removing the growths from the cranial bones. The diploë and inner and outer tables looked alike, though there was on each surface a thin layer of rather harder bone. In some places the inner table had completely disappeared.

In the outer or harder portion the medullary spaces were unusually wide and were filled with a delicate, almost myxomatous, connective tissue. In the softer parts the medullary spaces were very large and the medullary tissue was replaced by a neoplastic fibrous growth.

The bony trabeculæ showed notable changes indicating a reversion to a cartilaginous-like (chondroid) stage.

The development of large bony growths in connection with the bones of the skull is rather rare, and has of late attracted considerable attention. The jaws, which are the seat of the disease in the first of the patients herein reported, are less frequently attacked than the cranial bones.

The tumors grow slowly after beginning, as a rule, in the period of youth. Considerable pain is caused by pressure upon nerve filaments entangled in, or pressed upon, by the tumors. When pressure is exerted upon the eyeball by involvement of the orbit, displacement of the eye occurs, causing double vision. Pressure on the brain may cause epileptic attacks. Occlusion of the nares, from extension towards the nasal chambers of growths involving the upper jaw and antrum, is not unusual.

Dr. Roberts had advocated operative removal of the tumors in these patients, but had not, as yet, obtained consent to such active treatment. The slow progress of the disease has served to make them, to a certain extent, reconciled to the deformity and discomfort.

Dr. William J. Taylor detailed the facts pertaining to a case of leontiasis which had recently been seen by him in the service of Dr. W. W. Keen, at the Orthopædic Hospital. A man, aged twenty-one years, had applied for relief from a large tumor involving the right frontal region, which he stated had been growing since he was six years of age, but only in the last year had the enlargement been rapid. At present it involves the whole of the right side of the forehead, the supraorbital ridge, and is pushing downward into the orbital cavity and the temporal fossa. There is no pain whatever, nor has there ever been any pain, and he seeks relief merely from the deformity caused by the tumor and the displacement of the eyeball downward.

His general health is excellent.

An operation was performed October 12, 1895, by Dr. Keen, assisted by the reporter.

A semicircular incision was made through the scalp and the periosteum pushed back, exposing the tumor. As there was a doubt as to the character of the tumor, whether it was an osteoma or possibly a cystic growth pushing forward the wall of the frontal sinus, or even possibly an intracranial growth without any intracranial symptoms, great care was exercised. There was a smooth and uniform overgrowth of the bone, which was chiselled away layer by layer, the outer layer being dense and the inner and by far the major portion very

vascular bone. The entire tumor was chiselled off, invading, for this purpose, the temporal fossa and the orbit, so that most of the upper border of the orbit in its outer two-thirds had to be removed. As the growth involved the supraorbital canal, the supraorbital nerve was sacrificed.

The bone was so vascular that at several points some of Horsley's bone putty was used to arrest the bleeding; the periosteum was stitched over the site of the tumor with catgut, and the wound closed by a subcuticular stitch of silver wire, in three portions. As the fatty tissue of the orbit was exposed in cutting away the border of the orbit, considerable violence was done to the eye, and for some days it was congested, but his recovery was uninterrupted, and he went home on October 21.

In two of the cases reported by Mr. Horsley, a very careful microscopic examination was made of the bony growth removed, and from these examinations he concluded that the nature of leontiasis ossium is a pathological entity in which both osteoplastic and osteoclastic processes are represented, and that it is a hopeless condition, for which operation, if extensively practised, offers considerable relief.

Bland Sutton ("Tumors, Innocent and Malignant," 1893, p. 30) speaks of cranial osteomata as being, as a rule, formidable objects when growing from the roof of the orbit or frontal bone, and that they not infrequently extend as deeply into the cranial cavity as they project beyond it.

Ziegler, in the second volume of his "Special Pathology," p. 173, which has just been published, gives a very elaborate account of the pathology of leontiasis ossium, and refers to Virchow's paper, which was published in 1865.

Mr. Spencer Watson, in the *Transactions of the Pathological Society*, Vol. XIX, p. 310, describes a case of a young man, aged twenty-one years, with a tumor which had been growing for twelve years, and was of bony hardness. It invaded the nostrils, thrust upward the malar bone, and displaced the eyeball, but without materially interfering with the sight of that organ. He died shortly after the tumor was removed by Sir William Fergusson, and it was found that in the middle and anterior fossæ there were two large bony growths. The optic nerve was elongated, but without presenting any abnormal appearance. The tumors together weighed ten and a half ounces.

DR. JAMES HENDRIE LLOYD said that these cases represent groups which are due to different causes. They have their relations to acromegaly and cretinism, on the one hand, and to hypertrophy and atrophy of the bones of the head and face, on the other. All these cases, however, present certain characteristic signs that make him believe that they are caused by obscure nervous trouble of some kind, —in other words, they are trophoneuroses.

With reference to leontiasis proper, it is well to remark that, in the first place, it is a very old and misleading term. It has been used since the time of Aræteus, and has been applied to several distinct affections. Thus it has been applied to a form of tubercular leprosy. It has also been used for a form of hyperostosis of the bones of the head and face, and this is the disease shown in some of Dr. Roberts's patients.

These cases of enlargement of the bones of the face, and especially of the frontal bones, do not seem to be due to syphilis or to any distinct cause with which we are acquainted. These cases have no connection with acromegaly, but present merely local overgrowth of bones,—in other words, they are cases of bone tumor, and, as in other cases of tumor, it is impossible to say what is the etiology of the growth.

As regards the treatment: the medical treatment has been found entirely useless in these bony overgrowths. They must look for relief at the hands of the surgeon. In the case of myxœdema or cretinism the thyroid extract may be used. In myxœdema there is no enlargement of bones, but in acromegaly such changes occur; this is one point in differential diagnosis. The thyroid extract has not been found useful in acromegaly, and this therapeutic fact serves to emphasize the differences between that disease and cretinism.

These affections of the bones sometimes show the opposite condition,—that is, there is atrophy instead of hypertrophy. The atrophic process may be unilateral and strictly limited by the median line, which is also sometimes seen in hypertrophy. These cases of atrophy have been shown to be due to a congenital interstitial neuritis; two autopsies have been reported, one by Mendel. But true cases of hemi-hypertrophy are more rare, and their causation is obscure.

DR. AUGUSTUS A. ESHNER remarked that leontiasis is to be considered a generic designation for a group of conditions having in common a leonine aspect of the countenance. This may be due to disease either of the soft parts or of bone. Thus, leprosy and recur-

rent erysipelas of the face may give rise to leontiasis, just as may enlargement of the bone of the face of varying degree. Among the affections that will require discrimination in this connection is that described by Paget a good many years ago, in which there occur enlargement and deformity of the long bones of the extremities as well as of the bones of the cranium rather than of the face. This disorder is known as "osteitis deformans" in distinction from hypertrophic osteitis or simple hyperostosis. This condition is also to be distinguished from acromegaly. In acromegaly, however, it is rather the bones of the face, and particularly the inferior maxilla, as well as the short bones of the hands and feet, that are enlarged. It thus results that the face assumes the outline of an irregular quadrilateral, in contrast with that of deforming osteitis, which may have the shape of an inverted triangle.

EDITORIAL ARTICLES.

GLUCK ON OSTEOPLASTY.[1]

PLASTIC operations are applicable not only to the soft tissues, but bone as well has become the special subject for these operations.

The injection of chemically irritating fluids into pseudoarthroses and retarded calluses, the introduction of ivory pegs to hasten bony growth, the pedunculated soft-part-periosteum-bone flaps, after the methods of Pirogoff, Von Langenbeck, and König, do not always accomplish the desired therapeutic result.

The employment of bony trituration, the bringing together of defective bony parts into apposed positions in order to facilitate suturing, the implantation of the peripheral fragment of one bone into the medullary canal of the central end of the other, are methods which can be successfully employed only within certain limits.

Some of these methods cause a diminution of the vitality of the part by removing important parts, and some of the procedures cause irreparable shortening of the limb.

These operations, carried out scientifically and applied to the proper cases, will continue to be employed with advantage in the future in a large number of cases. Where these and other autoplastic operations cannot be applied to a good advantage in defects of the tissues in general and in bone-defect, in particular, transplantation finds its proper application.

It is true that transplanted bits of living human bone, aseptically handled, can grow in place with the same results, whether they survive, retaining their vitality wholly or partially, or whether they become encapsulated as corpora aliena.

[1] Gluck (Berlin), Verhandlungen der deutschen Gesellschaft für Chirurgie, XXIV Kongress, 1895.

From this point of view it is entirely unnecessary, in order to cover a defect in the humerus or of the skull, to resect a piece from the tibia of the same individual in order to transplant it into the defect.

Instead of making new wounds in the patient and thus subjecting him to new dangers, it suffices to make the transplantation from the bone of a living animal or to employ other corpora aliena for the purpose. In this way animals' bone, ivory, and other aseptic organic materials can be made to become healed in, and absorbed, encapsulated, and partially or totally substituted by the growing bone in which they are planted and to which they furnish the irritation for osteogenesis. When the operation has not been thoroughly aseptic, and a part or the whole of the transplanted material, after the occurrence of suppuration with fistula-formation and the removal of the body as an eroded sequestrum has taken place, the primary transplantation has acted temporarily as a means of fixation and separation of the tissues, and as an internal splint, as it were, whereby the scar tissue in the bony defect has been given its desired position and the process of regeneration can go on in the location and position most advantageous for a satisfactory cure. In the fact that in this manner a callus of the desired length and position has been formed without contracture rests the value of this procedure. When the periosteum is absent, and a new formation of bone in the defect is not to be sought for, or when it is desired on the ground of asepsis to introduce unchangeable material, inorganic material can be introduced, such as hard rubber, celluloid, aluminium, bronze, steel, platinum, iridium, gold, etc., which answers for a support, and which can be introduced into the medullary canal or used as a ferrule over the bone ends. Metallic splints, spiral springs, or other apparatus can be devised, which can be aseptically incorporated into the bony skeleton. In this manner an enarthrosis can be overcome, and after a time the body may become healed in and remain harmless and without irritative reaction.

Finally, disinfected pathological cavities in bone can be filled

with stone, plaster of Paris, copper amalgam, etc., and aseptically closed. These materials can become permanently healed in, just as bits of sponge and other organic and inorganic substances.

Not only where a small foreign body is used as a cover of a defect, as in the skull, but also where large apparatus is made to serve the function, the support, or the motion of the part, can encapsulation and permanent fixation take place.

Neither necrosis in the wall of the medullary cavity, nor fistulæ and suppuration, nor general cellulitis, often resulting in the formation of granulation tissue, ulcers, or fistulæ, nor even the occurrence of the necessity for removing the foreign body can be presented as an argument against this method of treatment.

Every new and rational medical and mechanical therapeutic procedure will have failures along-side of its successes.

When it occurs that a pathological defect cannot be cured by the most recent surgical procedures, and when the part remains permanently defective, and when we also have to do with severe nervous affections, as infantile paralysis, or when the part has been lost by amputation or exarticulation, we can so employ prothetic appliances and orthopædic apparatus as to relieve to a very considerable degree the unnatural condition. In the employment of orthopædic appliances it is possible to contribute very much to the comfort of persons physically defective. The same may be said of the vicarious use of other parts.

What is instinctively used by such defective persons to take the place or atone for physical defects should be recognized by the physician and made use of as a vicarious instrument.

Gluck has made the following demonstrations:

(1) Numerous preparations and microscopic slides of ivory implanted in bone, which had been embedded for periods of time varying from days, months, and years.

(2) Metallic bodies which had been embedded in the bones of dogs, and with which the dogs had been running about for days and months without any irritation, and which had neither caused fistulæ

nor any other symptom. He also presented the specimen from a large dog from which the tibia with its periosteum had been resected and a metallic hinged apparatus introduced. The result was a perfect one.

(3) Patients who had carried for one, two, and five years respectively ivory phalanges, an ivory ulna, an ivory tibia, in a case of osteomyelitis with loss of the tibial diaphysis with the larger part of the periosteum; and a gold plate in a defect of the mandibula after extirpation of a sarcoma of the upper jaw. All of these foreign substances had become healed in and had functionated without causing irritation. Finally, cases of sarcoma of the humerus and tibia, which had been operated upon five and two years ago respectively, which had healed without recurrence, and in which an osteogenetic reparative process had been accomplished by an ivory splint.

(4) Professors Krönlein and Rose, Bircher, Godard, Maydl, Kopfstein, Professor Lücke and Fischer have employed ivory prothetic apparatus, which has become healed in and given a permanent cure of bone defects.

(5) Doizy, Thiriar, Claude Martin, Quénu, Schwarz, Le Dentu, Péan, and others have employed prothetic splints of aluminium in pseudoarthrosis and bony buccal defects with permanent results. In cases of saddle-nose and bony defects in the face, they implanted platinum and gold plates. Péan implanted a joint made of platino-iridium and hard rubber, which took the place of the scapulo-humeral articulation and two-thirds of the humerus. At the time the case was presented this mechanism had been implanted for two and one-fourth years, and the patient had used the joint without pain and irritation. The tuberculous disease for which the operation had been done was completely cured, and the patient had gained forty pounds in weight.

(6) Alexander Fränkel has reported his results in plastic surgery upon the skull with the use of celluloid plates. Fränkel, Von Eiselsberg, Wölfler, Fillenbaum, and Billroth have reported permanent cures by this method. Gluck reported the cases in which he had

used celluloid plates in defects of the skull before the German Surgical Congress in 1890. He uses these plates especially in connection with trephine openings.

(7) Le Dentu, Dreesmann, Trendelenburg, Sonnenburg, Mayer, Senn, Middeldorpf, and others have employed with good results the methods of filling bone defects recommended by Gluck.

(8) Gluck has presented cases of amputation of the thigh and of infantile paralysis which had been helped very much by prothetic apparatus. His endeavor in these paralytic cases is to apply such apparatus as shall perform as nearly as possible the function of the paralyzed muscles.

JAMES P. WARBASSE.

VON BERGMANN ON SOME ADVANCES IN BRAIN SURGERY.[1]

THE diagnosis of brain tumors is becoming more and more accurate, and their surgical treatment is becoming less and less dangerous.

In Jacksonian epilepsy, Von Bergmann believes that operative interference cannot accomplish much. He cites Eulenberg's statement that "by the excision of an area of the cerebral cortex the attacks may be made to stop for some time, but that they return after a while." Only those cases of cortical epilepsy are cured by trephining which are due to tumors, especially cysts, which are often the result of intrameningeal exudations due to traumatism over or within the circumscribed motor area. In all other cases Von Bergmann believes that a cure is doubtful.

Von Bergmann demonstrated before the surgical congress the method of opening the skull and of closing the remaining defect. He uses a circular saw connected with an electric motor. This instrument is stronger and broader than the ordinary saw, is made to revolve very rapidly, and can be made to cut out a bone-flap in a

[1] Verhandlungen der deutschen Gesellschaft für Chirurgie, XXIV Kongress, 1895.

very short time. The saw is used to cut through the thickness of the skull as far as the last layer of the inner table, and this is cut through with a chisel.

The greatest advances have been made in the technique of opening the skull for the treatment of intracranial suppuration following otitis, for brain abscesses, for epidural suppuration, for infectious sinus-thrombosis, and for leptomeningitis. The chief of these is chronic suppuration of the ear, and associated with this is the formation of cholesteatoma masses within the ear and extending to the brain and its adnexa. The fact that middle-ear suppuration so often extends into the cranium gives a valuable diagnostic clue to brain-disease when otitis can be discovered as a concurrent condition. From its seat of origin the otic suppuration extends through the tegmen tympani, or through the canals into the mastoid antrum. In the first case, the thin bony covering of the middle ear becomes the seat of an osteitis which extends then to the dura mater. Pachymeningitis is preceded by the extradural or epitympanic abscess and the intradural brain abscess. The smaller the abscess which develops from the more or less changed dura into the brain substance the more closely it lies against the dura, and only after a long time does it seem to become separated from the dura and to lie in the cortex of the temporal lobe. On account of the great difficulty in diagnosis between brain abscess and epitympanic abscess, it is necessary to so plan the operative procedure that it may answer for either condition. The operation should be conducted in such a way that it attacks first the earliest of the intracranial changes, and if that is found to have gone on to deep abscess of the brain the operation will be pursuing its regular course to attack that. The operation must first disclose the roof of the tympanic cavity. The field of operation is marked by two perpendicular lines, one in front of the ear, from the base of the tragus to the sagittal suture, and the other behind the ear from the posterior border of the mastoid process, running parallel with the first. By separating the auricle downward with the skin and periosteal funnel lining the external auditory canal, an area about the

breadth of two fingers will be uncovered. With the chisel or rotating saw a horizontal division of the bone is made backward to the incisura parietalis of the squamous suture where the long root of the zygomatic process continues into the temporal ridge. A four-cornered piece of bone is removed, measuring about two centimetres each way. The anterior vertical boundary of this piece has been given. Posteriorly a line is drawn parallel with the first, and passing upward from the point of junction of the linea temporalis with the incisura parietalis. The two upper ends of these lines are connected by a horizontal furrow, parallel to the one over the temporal line. With an elevatorium the dura with its temporal lobe is lifted from its anterior and superior pyramid surface, and the region over the tegmen tympani is exposed. Through the same opening, by introducing a sound through the opened roof of the cavum tympani, the mastoid antrum can be reached, and by chiselling out the opening, pus can be liberated from this source without endangering the facial nerve.

Great advances have been made in the endocranial surgical treatment of infective sinus-thromboses. Jansen has reported a large number of cases successfully operated upon in the University Ear Clinic at Berlin. Out of twenty such cases, fourteen were characterized by large abscesses about the sinus; and in eleven of these were large epitympanic abscesses,—*i.e.*, extradural abscesses of the middle fossa of the skull. In these cases von Bergmann did a simultaneous operation on the tegmen tympani and on the sinus. The upper border of the sinus transversus lies in a straight-line continuation of the first bone incision along the temporal ridge, above mentioned. By chiselling through the bone in the postero-inferior angle of the quadrilateral opening referred to the sinus is easily reached, as it comes over towards the middle of the mastoid processs. The other path by which it can be reached is through the mastoid portion of the temporal bone. By this method three steps can be pursued. The first involves the accessory cavities of the ear, the mastoid antrum and the mastoid cells connecting with the wall of the posterior auditory canal; the second involves the course of the sinus in

the sigmoid fossa; and the third involves the posterior fossa of the skull above the cerebellum. After laying open the outer wall of the mastoid process as far as the junction of the lambdoid, parietal, and mastoideal sutures valuable diagnostic observations can be made before going further. The appearance of drops of pus oozing out signify that a perisinuous abscess exists, and the presence of a thrombus in the sinus is a sure sign of thrombosis of the cavernous sinus. The division of bone is then continued with a flat chisel from the antrum, which has now been laid open backward; or with the bone-cutting forceps the septa between the cells of the mastoid bone can be cut away until the sigmoid fossa is finally opened into. The anterior and lateral walls of the sinus are then opened. If the sinus is found surrounded with pus, in order not to introduce purulent material into the blood-current by opening the sinus, it is best to ligate the jugular vein, which is often plugged with blood-clot, and then the sinus can be opened and emptied. Any hæmorrhage which may occur can be easily checked by tamponning with iodoform gauze. The results obtained by opening the sinus in this manner are well worthy of note. Six out of thirteen of Jansen's cases were cured; thirteen out of seventeen of Macewen's; and eight out of fifteen of other authors were brought to recovery. Thrombosis of the transverse sinus, with its perisinuous abscesses, can become very extensive, and is usually the connective lesion between middle-ear suppuration and abscess of the cerebellum. The abscess usually lies in the lobus quadrangularis and semilunaris of the cerebellum which are bordered by the fossa sigmoidea. By further exposing the mastoid process in its posterior third and chiselling backward and downward as far as the upper border of the linea arcuata superior, which must not be crossed in the operation, a considerable area of the dura covering the cerebellum in the postero-inferior fossa of the skull is exposed.

JAMES P. WARBASSE.

INDEX TO SURGICAL PROGRESS.

GENERAL SURGERY.

On the Use of Parietal Peritoneum as Material for Sutures and Ligatures. By DR. L. ARANGINO (Cagliari). The writer takes the parietal peritoneum of cattle or horses, cuts it into strips of various widths, twists these into cords, and dries them for two to four days. After freeing from fat in ether they are soaked in a 2-per-cent. solution of bichloride of mercury in alcohol, and then preserved in a weaker solution of the same. Or they can be sterilized by placing in oil of juniper and heating to boiling for ten minutes, and then preserving in absolute alcohol. He has tested the sterilization by careful culture tests. He claims for this material that it is easily prepared, is strong, manageable, absorbable, and easily sterilized.—*La Clinica Chirurgica*, August, 1895.

W. B. FENN (Colorado Springs).

HEAD AND NECK.

I. Operations on the Gasserian Ganglion. By W. W. KEEN, M.D. (Philadelphia). The author reports the details of six cases in which he attacked the Gasserian ganglion for the relief of inveterate neuralgia of the trigeminal nerve, and prefaces the case reports by critical remarks upon the operation. In all the operations the skull was opened by the Hartley-Krause method. Troublesome hæmorrhage from the middle meningeal artery was experienced in most of the cases. In two cases the main trunk of the middle meningeal was ruptured at the foramen spinosum, and it was possible to control the bleeding only by packing a narrow strip of iodoform

gauze tightly into the opening. This was removed on the third day, with no recurrence of bleeding.

The lifting of the dura from the bone of the middle fossa he found always to be attended with rather profuse bleeding requiring packing for its control. In three of the earlier cases he deferred the further step of the operation for three days on account of this tendency to bleed, In later operations he has been able, after a temporary packing, to proceed with the operation and complete it at the time. He suggests from his experience that it is much better to operate with the head resting on the occiput and with a good side light, since in this position the blood runs out as rapidly as it oozes, and does not obscure the deep-seated parts.

As soon as the hæmorrhage in the middle fossa is stopped by temporary packing and sponging, the points of exit of the second and third divisions of the ganglion through the foramen rotundum and foramen ovale can be recognized by the folds or lines of traction produced by lifting the dura. These lines of traction converge at the foramina. Another guide to the third division also is the main trunk of the middle meningeal, which lies at a distance outside the foramen ovale, varying, as Taylor has shown, from $\frac{2}{16}$ to $\frac{9}{16}$ of an inch. The ganglion lies at the junction of the axes of the second and third divisions, and the object of the operator is now to completely uncover and separate the second and third divisions, and then the ganglion itself, from the dura. For this purpose he has found the best instrument to be the curved end of the Allis dissector. The dura is gently but firmly drawn back in the axis, first of the second and later of the third divisions of the nerve, and when the ganglion is reached, by still further traction on the dura, the entire ganglion can be disclosed. It appears like a net-work of fibres. Having isolated the ganglion and the two divisions, not only from the dura above, but also underneath them, the best way to remove the ganglion with its divisions and its roots, he says, is as follows: First, *seize the ganglion itself* with a pair of hæmostatic forceps; then, and not before, cut the second and third divisions at their foramina; and, lastly, by a gentle but firm rotation

of the forceps the ganglion and its divisions can be avulsed, usually bringing with the mass the sensory root, and the motor root all the way back to the pons.

If the second and third divisions are cut at the foramina before the ganglion is seized and an attempt is made to tear them and the ganglion out, the two divisions will generally tear off from the ganglion and the latter be left behind. In most of the cases thus far reported the operation has consisted in dividing and tearing away the second and third divisions, and then breaking up the ganglion by the curette or other instruments. Such was the case in all his own cases except the sixth, in which the ganglion and the attached roots were unmistakably wholly evulsed.

This can be done, as his last case proves, without seriously wounding the cavernous sinus.

In his first four cases he had no trouble from corneal ulceration, although he did not stitch the eyelids together. In his fifth case, in which the destruction of the ganglion was more complete than in the preceding cases, a corneal ulcer formed shortly after the operation, although the eyeball was protected for four days by an occlusive dressing. In his sixth case, the one in which the evulsion of the ganglion was complete, he kept the eyelids closed by sutures for four days, at the end of which time he permitted the eyeball to be exposed. Twenty-four hours later ulceration of the cornea had begun, and the lids were again stitched together. After a few days the same result followed a second attempt to have the eyeball uncovered, and at the time of the report it seems that any further exposure of the cornea has not been deemed advisable.

It is noticeable that this corneal ulceration followed only in the two cases; one of extensive destruction, and the other of absolute removal of the ganglion. Krause has reported eight such complete removals with one death. One of the seven that recovered was suffering from chronic conjunctivitis at the time of operation. A corneal ulcer formed, but was cured. None of the others suffered.

In future, Keen will unite the two lids in the centre and keep

them united for some time after the operation, in order to make sure of the safety of the eye.

As to the permanence of the cure this seems to be thus far more satisfactory than the results from any of the peripheral operations. The only recurrences that Keen has seen reported are one case of Rose's and two of his own. Rose's was only a partial return, and his own two are very probably not true recurrences which will lead to a relapse.—*American Journal Medical Sciences*, January, 1896.

II. A Brain-Cyst treated by Operation. By Dr. Graser (Erlangen). A forty-five-year-old man suddenly observed, while at work, that he could not move the ring-finger and little finger of his right hand. By the end of four weeks the entire right arm was paralyzed. In the third week he had attacks of cramps, first without and later with disturbance of the intellect. The diagnosis of brain-tumor was made upon the evidence of congestion of the retina.

The skull was opened and a smooth-walled cyst, the size of a walnut, filled with clear serous fluid, was found in the expected location. The wall of the cyst was two millimetres thick, and microscopic examination showed that it was made up of but slightly-changed brain tissue. The cyst was freely opened and tamponned with gauze. After the operation all of the symptoms subsided.

After five days the paralysis returned; and there was recurrence of the spasmodic attacks. Upon exposing the cyst a second time nothing abnormal was found. Some prolapse of the brain occurred as the symptoms increased.

While the patient lived, it was assumed that there was a second seat of disease. The autopsy, four weeks after the operation, showed a second cyst in the right frontal lobe, somewhat larger than the first, and associated with the remains of an old hæmorrhage. Its wall was perfectly smooth. Microscopical examination showed about the tumor the remains of a similar cyst with numerous dilated blood-vessels, surrounded by a proliferation of new cells. The sarcomatous growth filled the space between the vessels, so that there was presented an appearance which much resembled carcinomatous strings and nests.

On the surface and in many places were hæmorrhagic points of more or less size. This tumor must be placed with that class designated by Arnold as "perithelial sarcoma." This case teaches that neither the macroscopic nor histological examination of a portion of cyst wall gives any evidence that a cyst might have developed from the tumor under observation. There was no sign of remains of a similar tumor in the cyst wall which prolapsed through the wound of operation.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXIV Kongress, 1895.

III. A Case of Collateral Hemiplegia from Intradural Apoplexy. By Dr. Ledderhose (Strassburg). A thirty-eight-year-old man was assaulted, being knocked down and beaten and kicked about the head. He became profoundly unconscious. On the following day he complained of severe headache and weakness. These symptoms increased so markedly until the ninth day that the patient had to be put to bed. Then pronounced symptoms of brain pressure commenced. Ledderhose saw the patient on the twelfth day after the injury. He was in a state of deep coma; the breathing was stertorous; the conjunctival reflex was absent; the pupils were moderately dilated and almost without reaction; the pulse-rate was 80 and irregular.

Further, he observed that pronounced right-sided hemiplegia and paresis of the right facial nerve were present, having existed for two days. The examination of the head and the ears showed absolutely no traces of the injuries.

Assuming that there was an hæmatoma of the middle meningeal artery, the skull was trephined at Krönlein's point on the left side, the side opposite the paralysis. No collection of blood was found. The symptoms of pressure continued, and on the following day the patient died.

At the autopsy no injuries of the soft parts or bone were found; and in the left side of the skull there was nothing abnormal excepting a slight bloody discoloration of the pia.

On the other hand, on the right side, the side upon which the

paralysis existed, there was found a large, ovoid, intradural blood extravasation.

There was also found a considerable collection of blood on the right half of the base of the skull.

The brain itself was not changed. Ledderhose regarded this observation as a typical case of collateral hemiplegia, and claimed that in view of the literature upon this subject in lesions of the brain, hæmorrhages, abscesses, gummata, and tumors, it is possible for collateral hemiplegia to occur.

In the diagnostication of intracranial hæmorrhages with hemiplegia the condition of the pupils is a valuable guide.

Very often the pupils on the side of the hæmorrhage will be found dilated and without reaction.

Congestion of the retina is of much diagnostic importance, being caused by the entrance of blood into the sheath of the optic nerve, as Fürstner observed in cases of pachymeningitis hæmorrhagica.

When intracranial hæmorrhage with hemiplegia is operated upon by trephining, if the bloody tumor is not found upon the side opposite from the paralysis, the operation should be performed upon the other side of the skull.—*Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXIV Kongress, 1895.

IV. A Modification of König's Method of Osteoplasty. By Dr. Nicoladoni (Innsbruck). Nicoladoni has described a modification of König's skin-periosteum-bone-transplantation, which he has used in the case of a thirty-one-year-old man, who eighteen months before had sustained an extensive loss of bone through a splintering fracture of the left parietal bone. As a result of the accident, at the time of operation the patient had a bony defect six centimetres long and three and a half centimetres wide. This area was covered by a skin-covered pulsating scar. The patient had suffered almost constantly since the accident with headache.

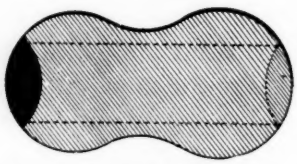
The author did not adopt the method of König, which in this case would consist in filling the defect with broken bits of bone, but

attempted a new method of his own devising. He marked out on the frontal bone, by means of a gutter, a bony plate seven centimetres by four centimetres in size. With a very fine, bent saw he sawed between the outer and inner tables of the skull in this area, and by thus splitting the diploë he was able to obtain a bony plate consisting of only the outer layer of the frontal bone. This plate he selected from a locality which had such a convexity as he would have over the uncovered area of brain. This was brought about and sutured in place. Thirteen days after the operation the whole thing had healed primarily. The headaches stopped, and the patient was completely cured. — *Verhandlungen der deutschen Gesellschaft für Chirurgie*, XXIV Kongress, 1895.

JAMES P. WARBASSE (Brooklyn).

ABDOMEN.

I. Five Cases of Colectomy. By MAYO ROBSON, F.R.C.S. (Leeds). In a paper read before the British Medical Association, the author reports five cases of excision of a segment of the colon, with recovery in all but one case. He attributes his good results in these cases largely to the use of the decalcified bone bobbin devised by him, which he greatly prefers to any other contrivance which has



Robson's decalcified bone bobbin.

been suggested for facilitating intestinal suture. He claims for it that it can be employed quickly; it is simple, secures an immediately patent channel, leaves no foreign body permanently in the passage, avoids stricture by securing continuity of the mucous surface, and can be adapted to any of the operations on the intestinal canal. The shape of this bobbin is shown in the accompanying diagram.

He acknowledges that there may be a saving of three or four

minutes in some cases by the use of Murphy's button, but thinks this of little importance in view of the special hazards attaching to the use of the latter instrument.

He has usually employed two rows of sutures, a mucous and a serous, in using the bobbin, but, when time was an object, he has not hesitated to employ one continuous stitch which may pass through the whole thickness of the gut, or may take up only the serous, muscular, and submucous coats, missing the mucous membrane. The individual cases reported are as follows:

CASE I. *Carcinoma of Descending Colon with Intussusception; Reduction of the Intussusception; Ablation of the Diseased Segment of the Colon.*—Female, aged twenty-seven years; frequently recurring attacks of colic and diarrhœa for a number of months; palpation of abdomen revealed a small tumor above the left iliac fossa. The abdominal walls were thin and flaccid, and during an attack the lump would be forced into the pelvis and a hard sausage-like lump could be felt in the course of the transverse and descending colon. Abdomen was opened in the left linea semilunaris, when it was found that the descending colon was intussuscepted into the sigmoid flexure, and that a tumor of the intestine formed the apex of the intussusception. Reduction easily effected; tumor brought to the surface, and the base of the loop of intestine containing it was encircled by an elastic tourniquet, after which the segment of colon, about five inches, containing the tumor was excised. The cut ends of the colon were sutured together over the bobbin, as above described, the parts cleansed, and the abdomen closed, thirty-five minutes having been consumed in the operation. No shock followed; the bowels were moved by enema at the end of the week; the further convalescence was uninterrupted. The growth was a carcinoma, which nearly completely encircled the bowel, but still permitted a finger to be passed through the lumen of the bowel at its site.

CASE II. *Carcinoma of Ascending Colon at the Age of Fourteen Years; Excision of Cæcum and Ascending Colon.*—Female, aged fourteen years, obstructive symptoms for six months; absolute ob-

struction, with fæcal vomiting for three days; great emaciation; hard tumor could be felt in the course of the ascending colon; temporary right iliac colostomy with relief to obstructive symptoms; three weeks later an incision of four inches was made, the colostomy opening being in the line of incision at its lower part. The bowel was rapidly detached from the parietes, when an elastic ligature was placed on the ileum and on the hepatic flexure of the colon, and as the tumor involved three to four inches of the colon, enterectomy was performed by dividing the ileum near its entrance to the colon and the ascending colon just below the hepatic flexure, the intermediate part, including the cæcum and ascending colon, being removed.

The blood-vessels in the mesocolon having been ligatured, the two ends of the bowel were united by means of a decalcified bone bobbin. The wound healed in a satisfactory manner, and the patient was discharged well at the end of a month, having gained considerably in weight. The bowels were moved naturally on the fourth day after operation.

The patient was seen six months afterwards, and expressed herself as being in perfect health. A recent report of her states that she is keeping well. The tumor proved to be a columnar epithelioma, which had almost completely obliterated the lumen of the colon.

CASE III. *Carcinoma of Cæcum; Colectomy.*—Male, aged forty years; for twelve months a tumor in the right iliac region had been noticeable, attended with constipation and emaciation. On opening the abdomen by an incision in the course of the right linea semilunaris wide-spread adhesions were found, and the omentum had to be ligatured in several places before it could be detached from the cæcum. The operation was performed exactly as in the last case, except that a Murphy's button was used instead of a bone bobbin. On the seventh day after the operation there was a little fæcal discharge from the wound, which lasted nearly a week. Although the wound healed by granulation, and the continuity of the intestine was manifestly established, the patient suffered from several attacks of

abdominal pain and vomiting, which prevented his discharge from the hospital. These attacks were apparently dependent on the button, and it was not until the forty-fourth day that he parted with it. He was kept under observation for ten days longer, during which time he had no recurrence of the pain or sickness, and then went home. The pathologist reported that the portion of bowel removed measured six inches, and that the tumor was a columnar-celled epithelioma involving the cæcum and ascending colon.

CASE IV. *Fæcal Fistula and Ulceration with Stricture of Ascending Colon; Excision of Cæcum and Ascending Colon; Death.*—Male, aged twelve years; history of six months' purulent and three months of fæcal discharge from a sinus which communicated with a large abscess cavity. On opening the abdomen, the intestinal adhesions seemed almost insuperable, though after a time the cæcum and ascending colon were isolated from the adherent omentum and small gut. It was then found that the fistula was in the back of the ascending colon, which was strictured and ulcerated from the cæcum to the hepatic flexure. Enterectomy was performed, the open end of the ileum being fixed to the cut end of the colon by means of a bone bobbin. Unfortunately, on account of the large abscess cavity and suppurating tracts, strict asepsis was impracticable, though the parts were made as pure as possible, and free drainage of the abscess cavity through the fistula was adopted. The patient suffered severely from shock, but rallied somewhat on the second day. Although there was no distention and no increase of temperature, the pulse remained quick, and he died three days after operation. It was found that seven inches of bowel had been removed, including the cæcum and ascending colon. The vermiform appendix was apparently free from disease, but the rest of the bowel was ulcerated and much thickened, and the lumen was so contracted at certain parts that it would not allow the passage of the little finger.

CASE V. *Fæcal Fistula depending on Stricture of Ascending Colon treated by Partial Colectomy and Enteroplasty.*—The patient was a girl of sixteen years, who had been ill for eighteen months with

ulceration of the bowel, ending in abscess and fæcal fistula, the latter being kept open by a stricture of the gut below the fistula. Partial enterectomy followed by enteroplasty resulted in complete recovery and perfect restoration to health.—*British Medical Journal*, October 19, 1895.

II. A Lymphatic Cyst of the Mesentery. By Dr. Davide Giordano (Venice). In a woman, sixty-three years of age, a tumor developed, attaining in three months from the time it was first noticed the size of an adult head, and producing enlargement of the lower part of the abdomen. There were no symptoms except a slight nausea. On examination, a diagnosis of ovarian cyst was made. In the operation for removal the tumor was found to be covered with a second layer of peritoneum, which formed a band behind the tumor, connecting it to the posterior wall of the abdomen. From this peritoneal covering the tumor was enucleated, having no pedicle. It contained about two litres of a brownish fluid with a specific gravity of 1014, neutral in reaction, and rich in albumen, with crystals of cholesterin, fine fat globules, and crenated blood-cells. The sac wall showed a net-work of fine vessels joining small cysts and full of white globules. There was no endothelial nor epithelial layer on the free surface. The writer concludes that the tumor was a cyst of the mesentery of lymphatic origin, into which hæmorrhage had taken place.—*La Clinica Chirurgica*, June, 1895.

III. Fæcal Impaction due to Congenital Stenosis of Anus. By Dr. A. Albanese (Palermo). The case was seen in the practice of Professor Tansini. A young merchant, twenty-one years of age, had at his birth no anal orifice. A simple incision by a local surgeon sufficed to permit the passage of meconium, but afterwards a stool could only be passed after the introduction of a catheter into the bowel. Later, on the advice of a physician, injections were resorted to. The boy became weary of this, and finally refused all treatment, contenting himself with the infrequent spontaneous evacuations. The parents were satisfied, as the boy had a good appetite and grew nor-

mally. From his twelfth year the evacuations became gradually less frequent, so much so that the patient has gone two months without a stool, and at the last even three months. In the intervals occurred frequent involuntary emissions of small quantities of feculent fluid. Every evacuation proper was preceded by intense pain over the whole abdomen, which culminated in the emission of fæces with large quantities of gas. Of late the patient had become despondent, the abdomen gradually became tumefied, and his nutrition suffered, although his appetite remained. Finally, Professor Tansini was summoned in haste, the patient not having had an evacuation for three months, and symptoms of intestinal obstruction having developed. The patient was normally developed but emaciated, the heart-sounds weak, and the respiration rapid and superficial. The tumefaction of the abdomen was marked, there was great resistance felt on palpation, which in the lower half was almost stony. There was dull tympany over the epigastric region, and over the rest of the abdomen absolute flatness. The anal orifice appeared normal, but the finger could not pass the hard rigid band which corresponded to the sphincter. Proctotomy and dilatation were advised and promptly performed. An incision was made posteriorly, the opening dilated with the finger and instruments, so that the hand could be passed into the bowel. After two hours of fatiguing labor with the hand and a large spoon, aided by pressure on the abdominal walls, *fourteen kilogrammes* of hard compact fæces were removed. In the next few days further large quantities escaped by the help of clysters. The patient gradually recovered and returned to his business.—*La Clinica Chirurgica*, May, 1895.

IV. Reducible Hernia of the Left Ischio-Rectal Fossa. By PROFESSOR E. BOLLINI (Pavía). The writer describes in detail a case of reducible hernia of the left ischio-rectal fossa. The hernial tumor was about the size of a cocoa-nut, easily reducible, leaving on reduction a depression in which the fist could "nest." As the woman depended on labor for her livelihood, and was determined to be relieved, an operation was attempted. The patient was

placed in the lithotomy position, and a vertical incision made parallel with the ascending ramus ischii across the whole tumor. Having uncovered the mass of fat of the fossa, it was isolated and removed, then the fibres of the levator ani were separated, and the subperitoneal fat and peritoneum carefully opened. The sac contained a fold of small intestime, the left ovary and tube, and part of the sigmoid flexure. The wound was closed with deep catgut sutures, bringing together the tissues around the vagina and rectum and the aponeurosis of the internal obturator muscle. The result was perfect at the time the patient left the hospital.—*La Clinica Chirurgica*, August, 1895.

W. B. FENN (Colorado Springs).

BONES, JOINTS, ORTHOPÆDIC.

I. The Treatment of Elbow-Joint Fractures in the Position of Acute Flexion without Splints. By H. L. SMITH, M.D. (Boston). From a series of experimental fractures, and from the results obtained in the treatment of more than thirty cases, the writer believes the following propositions justified:

(1) All fractures of the lower end of the humerus, once in position, are held in place if the forearm is kept acutely flexed.

(2) Such flexion can be used without danger to the limb or undue distress to the patient.

(3) The only force required being one of flexion, no rigid apparatus is needed, it being sufficient to strap the forearm to the arm. One of the strong points of this treatment, therefore, is its perfect simplicity.

(4) The only points to emphasize are: Be sure to replace fragments as flexion is made, taking great care that the internal condyle is as low as possible and the joint not widened by effusion between fragments. If the condyle is kept down no gunstock deformity can occur.

(5) In the cases thus far treated the amount of motion gained has been slightly greater than after ordinary methods. The amount

of deformity has been very much less.—*British Medical and Surgical Journal,* July 4, 1895.

II. Tendon Transplantation for the Relief of Paralytic Deformities. By JOEL E. GOLDTHWAIT, M.D. (Boston). The purpose of this paper is to show the possibility of furnishing better mechanical attachments for the non-paralyzed muscles in the treatment of paralytic deformities.

The best results are to be looked for in the cases in which one group of muscles is paralyzed, leaving the antagonizing or accessory group unimpaired. Much of the deformity is due to the action of these muscles without the control of the other group.

Four cases are reported after at least three months since the operation. The first case, that of an adult, was operated upon over a year ago. In all there has been a marked improvement. In three cases the peronæus longus was attached to the tendo Achillis and the peronæus brevis to the flexor longus pollicis. In two cases the anterior tibial tendon was attached to the peronæus tertius.

The tendons were attached by splitting one and drawing the other through this and suturing them with quilted sutures.

The method of attaching the tendons is of great importance, since, unless they are firmly joined, the benefit of the operation is lost. Thus far the operations have been performed upon the feet, but there is no reason why the same principle should not be employed in other parts of the body.—*Boston Medical and Surgical Journal,* January 9, 1896.

MALE GENITO-URINARY ORGANS.

Perineal Prostatectomy combined with Suprapubic Cystotomy. By SAMUEL ALEXANDER, M.D. (New York). The author advocates the removal of adeno-myomatous growths of the prostate, which cause obstruction to micturition by a method which involves both suprapubic and perineal sections, but with enucleation of the growths through the latter, the opening in the bladder above the pubes

being simply for the purpose of pressing down the prostate by the finger, so that it can be reached from the perineum. By this operation the mucous membrane of the bladder and that of the prostatic urethra need not be injured. The membranous urethra is opened at the close of the operation and a drainage-tube inserted through it into the bladder and allowed to remain *in situ* for about ten days. Suprapubic drainage is also provided for during the first week. His technique is as follows:

After the suprapubic opening and exploration has been made, the patient is placed in the lithotomy posture. A staff is passed into the bladder through the urethra and held by an assistant. The membranous urethra is then opened by a median perineal section, the floor of the urethra being thoroughly cut from just behind the bulb back to the apex of the prostate. This must be done thoroughly.

Two fingers of the left hand are then passed into the bladder through the suprapubic wound, and by these the prostate is pressed downward into the perineum.

With the forefinger of the right hand the surgeon begins the enucleation, which is performed entirely through the perineal opening.

The outer sheath of the prostate is broken into by the finger just beneath the mucous membrane of the prostatic urethra, and the entire prostate is shelled out from within its sheath by digital dissection. The mucous membrane of the bladder and prostatic urethra with the underlying muscular tunic is stripped up, but is not opened.

The right and left lobes are first removed, after which, if there is a middle projecting tumor, this can be pressed downward into the perineal wound and enucleated in the same manner. During the enucleation the prostate is to be drawn down into the perineum by forceps.

After the removal of all the prostatic growths the wound is flushed, a perineal tube is inserted into the bladder, and a rubber

drainage-tube of moderate size is placed in the bladder above the pubes. The upper part of the suprapubic wound is then closed by sutures.

The after-treatment consists in daily washings of the bladder, fluid being injected into the suprapubic tube. All urine flows out of the perineal tube.

The upper tube is removed on the sixth day, and the lower tube three days later, after which the bladder is washed by catheter through the perineum for a few days.

A full-sized sound is passed at the end of the second week, and then every five days until the perineal opening closes. The wounds have usually healed in the course of five weeks.

The advantages claimed for this method are,—

(1) Great diminution in the hæmorrhage.

(2) The mucous membrane of the bladder and prostatic urethra is kept intact, thus avoiding the danger of septic absorption.

(3) The best possible drainage of the bladder is secured.—*New York Medical Journal*, February 8, 1896.

FEMALE GENITO-URINARY ORGANS.

I. The Causes of the Normal and Pathological Positions of the Uterus. By A. MACKENRODT. The author believes that the cause of the uterus retaining its position in anteversion is not to be sought in any inherent tendency to bend forward which the uterus may possess, since it assumes a straight position when removed from the body; neither is it held in place by the round ligaments, since it maintains its normal position when these ligaments are cut. The true explanation may be found by studying the pelvic fascia and its attachments to the cervix. The author's observations on this subject are summed up as follows:

(1) The pelvic fascia which closes the lower opening of the peritoneal cavity is not perforated by the vagina, but instead it sends strong bundles of fibres to the cervix and top of the vagina, incorporating these structures in the floor of the pelvis.

(2) The cervix is so held by the pelvic fascia that the lower end points backward and the upper end is directed forward towards the symphysis; a position which the genital canal has in the fœtus.

(3) The normal anteversio-flexion is produced by a bending of the upper part of the cervix. The body of the uterus is not flexed, but its axis is continuous with the axis of the upper part of the cervix.

(4) The uterus is not held in position by its ligaments, but keeps the direction given it by the upper part of the cervix and is held by its own weight and the intra-abdominal pressure.

(5) The perineal muscles are of secondary importance in supporting the intra-abdominal pressure.

(6) The cause of the uterus retaining its normal position is to be found in the peculiar attachments of the cervix by its ligaments derived from the pelvic fascia.

The pelvic fascia is attached in part to the internal muscles of the pelvis, and especially to the ileo-psoas. The rigidity of the fascia depends largely upon the condition of these muscles; when they are atrophic, the ligaments are relaxed and allow the uterus to assume an abnormal position, and when once relaxed there is but little tendency for them to recover their normal tone even after parturition.

Anteflexion appears most frequently as a congenital deformity, and is caused by the development of a long, slender uterus in a wide pelvis. The condition continues during puberty, but is cured by the first pregnancy. Acquired anteflexion occurs only as transitory condition after childbirth, when the involution of the cervix is rapid, allowing the heavy body of the uterus to fall forward.

Anteversion should not be identified with the normal position of the uterus. It is a pathological condition caused by chronic metritis which produces parenchymatous changes in the body of the uterus. The uterine walls become stiff, and the axis becomes a straight line instead of a curve. With normal ligaments a uterus in this condition will assume an anterior position, but if the ligaments be relaxed, it will be pushed back into retroversion by the bladder.

With a slight relaxation of the ligaments the normal uterus occasionally rotates on its transverse axis so that the vaginal portion approaches the symphysis and the fundus the sacrum. Most frequently the condition is found after chronic metritis or after delivery.

Retroflexion appears seldom as a congenital condition, but is developed by relaxation of the ligaments of the cervix and weakening of the walls of the uterus. It is sometimes found in multiparæ and virgins, and is caused in part by long-continued overfilling of the bladder and rectum. Some families are especially liable to this trouble. The most frequent cause is parturition, by which the ligaments become overstretched or torn and fail to regain their normal condition.

Descent of the uterus is brought about by stretching and atrophy of the ligaments of the cervix and vagina and also atrophy of the internal pelvic muscles. The uterus is usually soft and flexible and has a tendency to become retroflexed. A permanent cure is only possible when the retroversion is cured.

The purpose of the paper is to show that the explanation of the pathological positions of the uterus is easy when one keeps in mind that the uterus is held in position by the pelvic fascia keeping the cervix and vagina in a definite position and at a definite height. The position is changed by anything which alters the structure or tone of the ligaments. A spontaneous cure can but seldom be expected and treatment is always demanded.—*Archiv für Gynäcologie*, Band XLVIII, Heft 3.

GEORGE R. WHITE (New York).

II. A Case of Implantation of the Ureter into the Bladder. By Dr. F. WESTERMARK (Stockholm). The patient, a lady, about forty years old, was operated on for cancer of the cervix and upper part of the vagina, May 2, 1894, and a complete extirpation of the uterus and both adnexa through a perineal incision was made.

When the incision, which commenced about two centimetres

above the sacro-coccygeal articulation, and was carried downward on the right side of the anus to the post-commissure of the vulva, was completed and the coccyx removed, it was found that the disease had extended to the bladder and left ureter, which latter had to be divided and its peripheral end removed, together with a piece of the bladder, about four centimetres in diameter around the outlet of the ureter. The uterus and the other diseased parts having now been removed the next step was to close the defect in the bladder. The catgut suture was made in two tiers, the first tier included the superficial and muscular layers, the second tier was placed close above the first and included only the superficial layers. This suture was continued to within one centimetre of the centre of the angle of the wound, where an opening was left in which the proximal (central) end of the ureter was sutured with fine sterilized catgut. The needle was passed through the outer layers of the bladder, including the muscular coat, but not through the mucous membrane, then through the cut end of the ureter except mucosa, four millimetres upward (above the cut end) and out through the wall. In this way four sutures were made which united the sides of the wounded bladder with the like sides of the wall of the ureter.

On closing the sutures, therefore, the muscular layer of the ureter was placed in apposition to the same layer of the bladder and the connective tissue of the ureter in apposition to the connective tissue of the bladder. A new tier of sutures was now made covering the first tiers, the needle passing a few millimetres to the outside of them. Considerable stretching of the ureter was unavoidable because of the shortness of the stump left, wherefore some of the stitches cut through the coat of the ureter, but finally, after working three-quarters of an hour, the suturing was completed. The upper parts of the vagina and its posterior wall were now united by silk sutures and the peritoneum in Douglas's fossa closed with catgut sutures. The edges of the perineal wound were united, up to just behind the anus, and a couple of stitches were also made in the upper angle of the wound; the rest of it was left open and tamponned with Czerny's tampon.

The pulse could hardly be felt after the operation, but immediately 600 centimetres of a physiological solution of sodium chloride were injected subcutaneously and the pulse improved somewhat. In the afternoon she received another injection of 500 grammes of the same solution.

The urine increased steadily from 100 cubic centimetres, the day after the operation, to 1000 cubic centimetres nine days later, when she urinated spontaneously. The temperature in the axilla was never higher than 37.5° C. The patient was discharged from the hospital June 25, and her physician reports her still well February 9, 1895.

Dr. Westermark has performed perineal (sacral) hysterectomy thirteen times, in which the ureter has been divided three times, including this case reported at length.

In one case the central stump of the ureter was guided by a drainage-tube to the sacral wound and the kidney extirpated.

In the other case where there was only a partial division of the ureter a direct suture was made which healed by primary union. Experience has shown that the ureter is just as likely to be divided in sacral hysterectomy as in the vaginal, but by the sacral method an implantation of the ureter in the bladder is made possible. The author used no particular method in suturing, and concludes that carefulness in this, as in everything else, is the road to success.—*Hygeia*, No. 3, 1895.

A. G. THORÉN (New York City).

III. Final Results of Forty-seven Cases of Hysterectomy for Carcinoma. By W. W. RUSSELL, M.D. (Baltimore). The cases comprise all the cases operated upon at the Johns Hopkins Hospital since its opening in October, 1889, and in the private practice of Dr. H. A. Kelly up to October, 1895.

Vaginal hysterectomy was employed in forty cases, abdominal in four, and the combined operation in three cases.

Grouping them all under one head, the results are as follows:

Death from primary effect of operation	5 = 10	per cent.
Patients still living	21 = 44	"
Patients died with recurrence	16 = 34	"
Patients not heard from	4 = 8	"
Died from heart lesion	1 = 2	"

Three of the deaths immediately following the operation were due to peritonitis and two to ligation of the ureters.

Recurrence and death took place in the sixteen cases within eighteen months.

One patient, still living five years after hysterectomy, remained apparently well for more than three years, and then developed multiple metastatic nodules on both sides of the neck and in the axillæ, which are actively progressing.

The patient who died from heart lesion had developed carcinoma in the breast, which had been removed. A second patient, still living, free from pelvic trouble, is also the subject of breast carcinoma, which, though removed, has recurred.

One patient presented herself after three months with recurrence in the vaginal scar. This was dissected out, and the surrounding area cauterized. Two years and a half later she continues in excellent health. Local return occurred in all the cases terminating fatally, but in none of these was any history elicited of metastatic growths in other parts of the body.

In nine cases the body of the uterus, in thirty-eight the cervix, was the seat of disease.

Results of hysterectomy for carcinoma of the body:

Patients still living	7 = 77	per cent.
Patients died with recurrence, operation incomplete	1 = 11	"
Patients died from primary effect of operation	1 = 11	"
Number of cases still living, 5 years elapsed	1	
" " " " 3 " "	2	
" " " " 2 " "	2	
" " " " 1 " "	2	

The uterus was removed by supravaginal amputation in three cases. An ordinary vaginal hysterectomy was performed in the

remaining six. Recurrence has taken place therefore only in the case where the operation was not completed.

In some of the cases the growth had penetrated the walls of the uterus so that it could be seen just beneath the peritoneal covering, and yet no evidence of involvement of the lymphatics or the parametrium could be detected. The three cases in which the cervix was left have proved as satisfactory as those in which the whole uterus was removed.

Results in hysterectomy for carcinoma of the cervix:

Patients died from primary effect of the operation . .	4	= 10 per cent.
Patients still living	14	= 36 "
Patients died with recurrence	15	= 38 "
Patients not heard from	4	= 10 "
Operations over 4 years ago and patients still living	3	
" " 3 " " "	4	
" " 2 " " "	4	
" " 1 " " "	3	

The uterus was removed in four cases by the combined method. One of these died a few days after the operation from ligation of the ureter, and another, in which the disease was associated with pregnancy, died several months after operation with a recurrence in the vagina. The remaining two are reported as free from any suspicious signs.

Vaginal hysterectomy was employed in thirty-four cases, three of which died from the operation, and fourteen afterwards from the original disease.

The four cases not accounted for up to the present time were considered at the time of operation favorable for cure. Two of them seen, one two years after operation and the other one year, and both at that time showed no evidence of ulceration or induration by vaginal examination.

The fourteen women who are still living do not give symptoms pointing to metastasis or local recurrence, except the one mentioned with the nodules in the neck and axillæ.—*Johns Hopkins Hospital Bulletin*, December, 1895.

IV. A Case of Actinomycosis of the Uterus. By Dr. Davide Giordano (Venice). Dr. Giordano reports a case of actinomycosis of the uterus in a woman sixty-four years of age. For four years she had noticed a discharge from the vulva, usually consisting of blood, but sometimes yellowish and fetid. The uterus was prolapsed. The general health was good. On examination, the uterus was found slightly enlarged, with gaping os which admitted the end of a finger. A drop of the fetid yellow liquid was found at the os. This was turbid, containing grayish shreds dotted with yellow points and enclosed in capsules. Under the microscope these shreds showed the characteristic appearances of actinomycosis. The age of the woman and the condition of prolapse being considered, a vaginal hysterectomy was performed and the patient recovered perfectly.—*La Clinica Chirurgica*, June, 1895.

W. B. Fenn (Colorado Springs).

REVIEWS OF BOOKS.

A System of Surgery. Edited by Frederick Treves, F.R.C.S. Vol. I, pp. 1152. Philadelphia: Lea Brothers & Co., 1895.

Any book which is presented to the profession under the name of Mr. Treves is sure of a respectful reception. All his previous work justifies this attitude towards anything which he may now produce or father. When, therefore, in connection with this book we find him as editor associated with twenty-four other well-known London surgeons, it is *prima facie* evidence that as a whole the work is likely to be a valuable one. A careful study of it has revealed nothing which in the least militates against this idea, which the reviewer must admit to have been preconceived. Careful and accurate writing, close attention to practical usefulness, well-balanced distribution of space and material, and thorough editorial supervision, characterize this volume from cover to cover. An excellent level is maintained throughout. None of the articles are what could be called epoch-making, but none of them are conspicuously defective, and practical information brought up to the latest knowledge upon each subject abounds throughout.

The article on Surgical Bacteriology, by Mr. Sims Woodhead, is an excellent condensation of the whole subject. The earliest pages, on the general classification of bacteria, on the conditions of their life, on their habitat and distribution, and particularly on their methods of invasion, are most admirable; so, too, are the pages on predisposition to bacterial poisons and on immunity and the methods of producing it. The following concise summary includes, as a matter of fact, pretty much all that we know upon this subject: Whatever method be used, the following points are now almost proved:

(1) The immunizing substances are in all probability of a proteid nature; (2) sterilized cultures or filtrates deprived of their specific poisonous properties may have a marked power of producing immunity; (3) an inoculated animal is for a short time after inoculation more susceptible to an attack of the specific disease, but as soon as this stage of susceptibility has been passed the resistance is increased; (4) whenever specific bacteria are used, either in the virulent or in the attenuated form, the aim is to produce a mild attack of the disease, as a result of which the animal is immune; (5) the period required for the acquisition of immunity is in this case much greater than when antitoxic blood serum is used, in which last a protective influence is recognized almost immediately, or, at any rate, in the course of a few hours; (6) it is found, however, that the immunity so produced (the passing immunity of Ehrlich) is more transient than that obtained by inoculation with micro-organisms or their products; (7) the blood serum of naturally immune animals has not yet been proved capable of producing immunity when injected into susceptible animals.

In the description of the bacillus of tuberculosis it is to be noted that no mention is made of the effect of sunlight upon that important organism, and in the more strictly surgical article in which it is described, and to which a cross reference is made, we have failed to find a statement of this fact, which in the light of clinical experience with the hygienic treatment of tuberculosis would appear to be an important one. We believe it to be a fact, and on consulting the most recent article on the subject we find that the statement is made (Welch), that "when exposed in thin layers to direct action of the sun's rays they [the bacilli of tubercle] are killed in a few minutes."

Mr. Treves, in an address recently delivered on the "Surgical Aspect of Tuberculosis," says very truly, "Sunshine and dry air are deadly to the bacillus, and light and oxygen are of more value than all drugs. In the open air the tuberculous patient may feel safe. In England there is some difficulty in spending much time in the open air in the winter, although I have had patients with high temperatures

and suppurating wounds, with acute joint mischief and psoas abscesses, out of doors every day in the winter in spite of snow and frost and rain. The good results that I have seen to follow the operative treatment of spinal abscess have been due in no small degree to the fact that many of my patients after operation were able to be taken out of doors on a spinal carriage every day and all day through the whole of an English winter. The great feature of Thomas's splints lies in the fact that they permit the patient to move out of the house. If the patient can winter in a more suitable climate than England, let him go to a place where the air is dry and the sun bright, and where he can be out of doors all day."

There is more helpfulness for tuberculous patients in the foregoing paragraph than in all the "tonics" of all the pharmacopœias.

The articles on inflammation, suppuration, ulceration, etc., by Mr. Cheyne, are characterized by the clearness and comprehensiveness which that surgeon's work usually displays. It is interesting to note that the rules as to amputation in diabetic gangrene have been completely altered by the employment of antiseptic measures, and that from recent work it seems evident that the best treatment in the great majority of cases is as early amputation as possible. It is also interesting to note that the bacterial cause of the three forms of specific gangrene—namely, acute traumatic gangrene, phagedæna, and noma—is altogether unknown in the case of the first two, and that in the third the bacilli which are said to give rise to it are unnamed. He describes them as long and delicate and found in great numbers. While it seems safe to assume that this is probably true, it should not be forgotten that the uniform occurrence of the disease in a particular part of the face and its usual limitation to one side would suggest a possible nervous element in its causation. It might be that the bacillus which is found grows there because of the previous defective vitality, and does not originate it. Lingard has, however, found in the calf, which at certain seasons of the year is particularly liable to gangrenous stomatitis, a long bacillus, which he was able to cultivate, and by the inoculation of which in the same animal he was again able to

produce the local necrotic phenomena. Ranke's observation tends to confirm this theory, but, on the whole, it cannot be said to be proved.

We agree entirely with Mr. Cheyne's views, that complete anæsthesia could not be said to protect the patient against shock. On the contrary, as the context shows that he is referring to chloroform as the anæsthetic to be used, we should expect it to add to the dangers of the pre-existing condition. The reference of the causation of shock to the nervous system seems to us an instance of the one-sided application of a purely theoretical view which disregards obvious clinical facts. Mr. Cheyne is quite right in rejecting it. He is equally right in recommending as preventives of shock the continued application of external heat before and during the operation, the use of strychnine, and in cases associated with hæmorrhage the employment, either by enema or by transfusion, of large quantities of saline solutions.

Mr. Makins, who writes on "Surgical Diseases due to Microbic Infection," basing his opinions on the reports of Horsley and of the committee of the local government board, and on the papers of Pasteur, Roux, and Fleming, says that by the inoculation treatment of hydrophobia the mortality has been reduced from at least 14 per cent. to .95 per cent. He adds that the treatment is indicated in every case of bite by a rabid animal, that it will succeed in direct proportion to the promptness of its application, and that for a favorable prognosis it is necessary that inoculations should be begun before the sixth day after the bite. He does not allude to the arguments which occasionally appear in support of the theory that no such disease as hydrophobia exists, and, indeed, although they have been ably set forth by Dulles, they seem to lack substantial basis.

The able article by the editor on tuberculosis is a model of clear condensation. There are few important facts having any practical bearing on the surgical symptoms, prevention, or treatment of the disease which are not to be found in this chapter of twenty-two

pages. His views as to the rarity of the transmission of tuberculosis pulmonalis from an affected to a sound person seem, however, not quite in accord with all the facts. Treves says that "these examples have been mainly noticed in the persons of husbands and wives, or intimate friends, or nurses and patients. The cases, however, are quite uncommon, considering the wide prevalence of the disease. Jousset would place them as low as 2 per cent. This method of communicating tuberculosis is practically unknown in hospitals for consumption." He adds, "Were the seed alone the necessary thing, then all the nurses in hospitals for consumption should become tubercular, and from such institutions tuberculosis should spread as from a centre. Tuberculous disease, however, does not spread in this way, or only in a few very rare accidental instances." At the Johns Hopkins Hospital, however, about 6 per cent. of the cases of phthisis were in previously sound persons whose wives or husbands had died of the disease. Weber has reported cases, one of whom lost four wives in succession, one lost three, and four lost two each. (Osler, "Practice of Medicine," 2d ed., p. 210.) The investigations made by Cornet also seem to throw doubt on the accuracy of the view that the disease is rare among nurses. While the Brompton Hospital statistics support the statement of Mr. Treves, Cornet (quoted by Osler, *op. cit.*) says that of a hundred nurses deceased, sixty-three died of tuberculosis. The fact that it is a house disease seems fairly well demonstrated. Flick has studied its distribution in a ward in Philadelphia during a quarter of a century, and has shown that about 33 per cent. of infected houses have had more than one case. Less than one-third of the houses of the ward became infected with tuberculosis during the twenty-five years prior to 1888. Yet more than one-half of the deaths from this disease during the year 1888 occurred in those infected houses. All this, although of primary importance to medical men, is of almost equal interest to the surgeon. Mr. Treves's summary of his views as to constitutional treatment are, however, more likely to appeal especially to the latter. He says, "There are no drugs which are

specifics against tubercle, and three-fourths of the medicines given are administered not to treat the disease, but to soothe that inherited craving in the human race for physic, which is almost as uncontrollable as the craving for drink. The principal elements in the treatment are plenty of air, plenty of sunshine, and plenty of good food. Let the patient escape from the crowded city and live in the country; let him sleep with his bedroom windows open, winter and summer. So long as mere movement will not be in itself injurious, let him be moved out into the open air. Let him live in the open air."

Mr. Jonathan Hutchinson's interesting article on syphilis contains some statements which are not in accord with what we believe to be the experience of the profession. He says, "That syphilis is nowadays a much milder affection than in the Middle Ages is a very prevalent belief, without the slightest foundation, except in so far that the treatment of it has immensely improved." There seems, on the contrary, a good foundation for what he correctly describes as the prevailing view, in the thought that as all syphilis comes from pre-existing syphilis, the syphilitic of to-day is the inheritor of a bacterial disease which has since the Middle Ages passed through many generations of cultures in the living subject and has probably undergone a certain amount of attenuation. Mr. Hutchinson does not unreservedly accept the view of the microbic origin of syphilis, and this view therefore does not appeal to him. It is true that its bacterial cause has not been isolated or demonstrated, but all the evidence points irresistibly to its existence, and if that be assumed, the mitigation of the disease through the agency of time alone seems reasonable. It is also true clinically of the chancroid that it is far less severe than even fifty years ago, as well as far less frequent. Treatment is perhaps a factor of equal importance in both instances, but time and the effect of successive inoculations should not be ignored. The author begins treatment only when "a positive diagnosis of syphilis can be made," but he makes that diagnosis "fairly often" on the induration of the chancre and the "bullety enlarge-

ment of the inguinal glands." This is often or usually satisfactory, but it does not cover the exceptional cases in which non-specific infections (staphylococci or streptococci) produce induration and enlargement, which are clinically identical. As even Fournier has been deceived in such instances, others may be, and it seems safer in routine practice to wait for the post-cervical adenopathy, which in the great majority of cases of syphilis will speedily resolve all doubt.

Mr. Hutchinson unfortunately deals with the inunction method and the hypodermic methods in the same brief paragraphs. While we agree with his condemnation of the latter as a substitute for the usual treatment by the mouth, we would except the former, and, basing our judgment on the recorded experience of the profession, would uphold the value of the inunction method as an adjuvant to and an important part of the routine treatment of syphilis. The arguments in favor of it are unanswerable.

In his article on gonorrhœa the same writer says that one attack confers "no sort of immunity against a second one." Allusion might have been made to what careful observation of such cases will undoubtedly demonstrate,—viz., that second and later attacks are, as a rule, milder than primary ones. In the description of treatment no mention is made of salol or boric acid, of antiseptic irrigations, of the use of injections containing insoluble sediments, etc., and but little variety is given in the means described for the cure of this most important of minor surgical ailments. If the urethra is to be regarded as the property of specialists, this may be all right; if not, gonorrhœa and its complications should be assigned more than ten pages in such a work.

Mr. Sutton on "Tumors" and Mr. Pearce Gould on "Aneurism" and "Injuries and Diseases of Blood-Vessels" have contributed admirable articles, which cannot fail in spite of their necessary condensation to be of great practical value to the student and the practitioner. They represent the latest knowledge on these subjects. It is to be noted in passing that Mr. Gould says of Macewen's oper-

ation for securing by acupuncture a white clot in the treatment of aneurism that "it is evident that to pass needles in the way directed must be an exceedingly delicate operation, for if done carelessly the sac might be torn quite through. It is open to doubt whether a white clot, composed of fibrin and disintegrated corpuscles only, is formed, or that, if it were, its presence would be of greater value than ordinary blood clot. The treatment should only be employed when compression, ligature, and excision are alike impracticable."

Practical value would have been added to the article on the lymphatics by Mr. Morgan if the editor had included his own excellent teachings as to the topographical relations of the main lymphatic trunks, which throw so much light on the course and dissemination of many forms of cancer and tubercle, and also of the more acutely infective surgical diseases. The article by Dr. Gerrish in the latest American System of Surgery contains diagrams of lymphatic distribution likely to be most helpful to the practitioner.

In Mr. Bowlby's article on the nerves the excision of Meckel's ganglion is described, but no mention is made of any method of operating on the Gasserian ganglion, although many cases have now been reported, both by Rose's and by the Hartley-Krause procedure.

It seems to be unavoidable that surgical apparatus should be described by the use of proper names. The difficulty of accurate designation is apparently otherwise too great. But it is certainly unfortunate that it should be so. Some of the value of Mr. Stanley Boyd's excellent article on "Injuries of Bones" is undoubtedly lost to American readers by reason of their unfamiliarity with many of the terms employed. This remark refers more particularly to the general practitioner, who, while he might be familiar with Lister's, Thomas's, and Volkmann's splints, would probably know less about Carr's or Erichsen's or Arnold's or MacIntyre's or Cline's splint, or even Hodgen's, while he could not get a Bloxam's or a Salter's "cradle" if he wanted to. This is not meant to be fault-finding so far as this book is concerned, especially as in every possible case an illustration has accompanied the mention of the apparatus. But, as there is

probably more difference between the two countries in the methods of treatment of fractures than in any other line of surgical work, it seems a pity that the subject should be obscured by this apparently unavoidable rule of nomenclature, which, even when the names (as in Hodgen's case) are American, leaves many readers in doubt as to the details, and therefore as to the mechanical principles and value of the apparatus.

Hodgen's splint, by the way, is thought to be "clearly the best all-round splint for treatment of fractures of the thigh," though Thomas's knee-splint is said to have the advantage that "in cases for which it is suitable it gives greater freedom, the patient being able to get up and even to walk." This seems just enough allusion to the so-called "ambulant" treatment of fractures in the lower extremity to be dangerous, as we saw no further mention of the merits or demerits of the recent attempts in this direction, which we should be tempted to characterize as foolish and unsurgical, if it were not that they are being made by men in the front rank of the profession, and if we were not aware that every important addition to surgery has been called "unsurgical" by somebody at some time. We must confess, however, to a distinct disinclination to let our cases of fractured femur walk either in a Thomas's knee-splint or in any other form of dressing or apparatus.

In the discussions of fractures about the elbow no mention is made of the simple and valuable method described by Mr. Jones, of Liverpool, which is based on sound, anatomical considerations, and which, as the writer knows from experience, gives most admirable results. The advice as to the use of massage in the treatment of fractures commends itself to common sense. Where it can be done without causing displacement, or when employed as soon as there is no more fear of bending of callus, there is every reason to believe that it considerably shortens the period of disability.

Mr. Sutton's article on "Diseases of the Jaw" contains as much information as could well be put in the allotted space. In proportion to its length the article is (with perhaps the exception of Mr. Sutton's

other section on tumors) the best illustrated in the volume. We were glad to see in italics the following warning as to tumors occupying the antrum: "In all cases where there is doubt as to the nature of the tumor, *cut into it before proceeding to cut it out.*" Having known of several errors resulting from disregard of this excellent rule, and having seen two narrow escapes from excision of the superior maxilla for suppurative disease of the antrum, one in Dr. Agnew's practice and one in our own, we realize both the wisdom and the necessity of the above advice.

In his description of Kocher's method of reducing luxations of the shoulder, Mr. Sheild ignores the effect upon the *muscles* of the movements of external rotation and abduction, the relation of which to the deltoid and the supra- and infraspinatus is even more important than the effect upon the capsule which he describes, and which, so far as this first part of the manipulation is concerned, seems problematical. So, too, the elevation of the elbow in the second movement relaxes not only the untorn fibres of the upper part of the capsule, as he states, but also the tendon of the long head of the biceps passing over it, which is sometimes so stretched in the subcoracoid luxations as to be torn from its groove. It is largely because of these factors that Kocher's method succeeds oftener in subcoracoid than in other scapulo-humeral dislocations.

In obstinate cases of recurrent dislocation of the humerus, Mr. Sheild advises excision as "likely to give definite and permanent good results." This is probably true, but the tendency of the upper end of the bone after this excision to assume the position occupied by the head in subcoracoid dislocation should not be forgotten, and too much should not be promised the patient.

The perennial argument as to the cause of the difficulty in reduction in dislocations of the metacarpo-phalangeal joint of the thumb, which has been going on since the days of Dupuytren, is still in evidence. Mr. Sheild rejects the theory of the constriction of the neck of the metacarpal by the short flexor tendons, and prefers to believe that torn portions of the glenoid ligament wrapped around the neck

are the cause of the trouble. This is not unlike the view of Mr. Hey or that of Mr. Laurie (1837), but is not now the generally accepted theory.

Mr. Barker, in the article on the diseases of joints, argues on the one hand against very early and extensive operations, and on the other in favor of interference at what he considers an appropriate time. He summarizes his views as follows, and they certainly represent a rational mean between the two sets of extremists: "Briefly stated, my line of action in these cases would be as follows: Always and in every case to endeavor, by rest and other local treatment, to arrest the progress of the affection; but when the latter has gone on to undoubted destruction of the surfaces of the joint and abscesses within it, to operate for the removal of the contents of the latter before they have made wide ravages in the joints and surrounding structures. At the same time, such operations are to be as limited as possible. For instance, all hip-joints which are seen at an early stage of the tuberculous disease are at once treated by rest and splints, etc., and as long as these means appear to keep the morbid process in check they are persevered in. But when it becomes evident that liquefaction of the soft tissues of the joint is taking place, and that the bones are becoming destroyed, I feel justified in assuming that the ultimate results of operation for the removal of the diseased tissue will be at least as good as those arrived at by the expectant mode of treatment, and that they will be, in one respect, very much better,—*i.e.*, in saving much time to the patient, and in placing him in a position to use the limb often in as many months as years by any other expectant method. Moreover, the amount of joint-tissue necessarily removed in operations by this line of treatment I hold to be far less than is usually destroyed where the disease takes its course, even under the best treatment by splints, etc."

The cuts made from photographs showing the effect of forcible distention of the hip-joint in the cadaver of a child are very interesting, though the experiments are old ones.

Lack of space prevents further comment on this volume, which

on the whole reflects the greatest credit upon both authors and editor. The book when complete will make a most useful addition to the library of the surgeon and of the general practitioner.

We shall await with interest the appearance of the second and concluding volume, which will contain, we learn, about an equal number of pages. The illustrations, as a rule, are most creditable. The majority of them are original, and a successful effort has been made to do away with many of the familiar wood-cuts which have come down to us from the days of Cooper, Syme, and Fergusson.

Conceiving it to be the duty of a reviewer to note teachings from which he dissents, or omissions which he regards as important, a few instances have been above mentioned, but it must be understood that they serve only to illustrate by contrast the comprehensive character of the work and its great practical value.

J. WILLIAM WHITE.

SYSTEM OF SURGERY. Edited by FREDERIC S. DENNIS, M.D., assisted by JOHN S. BILLINGS, M.D. Vol. III. Surgery of the Larynx, Tongue, Jaws, Teeth, Salivary Glands, Neck, and Chest; Surgery of the Eye and Ear; Surgical Diseases of the Skin; Surgery of the Genito-Urinary System; Syphilis. Philadelphia: Lea Brothers & Co., 1895.

In this volume are treated some of the more distinctly specialized branches of surgery, such as the diseases of the throat, teeth, eye, ear, and skin. These subjects have been treated by masters in their particular branches, who, while not presenting exhaustive and technical essays, have, as a rule, treated their subjects in a full and comprehensive manner.

The chapter on the surgery of the larynx and throat is good in all respects but its title. From an anatomical point of view the boundaries of the throat are indefinite. The chapter which bears this title also includes the diseases of the nose. We, therefore, find diseases of the ethmoid cells under the heading, "Surgery of the Larynx and Throat;" and in the index of the contents of Vol. III, "Trachea"

is substituted for "Throat." In our reviews of the preceding volumes we have called attention to such discrepancies of an even more glaring character.

The chapter on the diseases of the mouth and tongue is concise and instructive. It contains some valuable statistics upon the subject of extirpation of the tongue for carcinoma; although some of our most recent knowledge of this important subject is not included. The diseases of the salivary glands are given a special chapter.

The diseases of the neck are disposed of rather briefly. Among the tumors of the neck, goitre is not included; and, in fact, the whole subject of tumors of the neck is unsatisfyingly brief.

In the chapter on the surgery of the chest, the resection of a piece of a rib is but lightly mentioned in the operations for empyema. The very excellent description of the operation for posterior œsophagotomy is quoted from Bryant. This chapter also contains a thrilling account of a mutiny on the high-seas, wherein is narrated how that "the mutineers, finding that they were overcome, set fire to the ship and jumped into the sea and perished."

The two chapters on the diseases of the eye and the operative surgery of the eye are excellent. They are well illustrated, and give clear and brief descriptions of diseases and operations for their cure. The same can be said of the chapter on the diseases of the ear. In the treatment of mastoid disease the author lays down sound surgical principles.

The chapter on the surgical diseases of the jaws and teeth is good, though it does not contain much on the subject of dental surgery.

The surgical diseases of the skin are well described; the description of lupus being a most excellent one.

The most thoroughly written and masterly chapter in this volume is the one devoted to the genito-urinary system. Though we cannot believe that "the symptoms of ruptured ureter are the same as those of ruptured kidney, except that they are of a much milder character," the surgery of the ureters is well set forth. Much is said

of the Nitze cystoscope, while the instrument of Leiter is not mentioned. Of this instrument the author says, "In many points cystoscopy is of great interest, but it can be hardly said to have advanced the surgery of the bladder as far as might be at the first glance imagined. In point of fact, about as accurate a knowledge of the proportions and situation of a growth or foreign body within the bladder walls may be obtained by means of a sound as by a cystoscope, and, furthermore, when the urine contains fragments of a tumor the microscope reveals the nature of that tumor or of a catarrhal condition of the mucous membrane quite as readily as a macroscopic examination through a cystoscope." The experiences of Dittel in the use of the cystoscope are interesting and instructive.

The various views of different observers concerning the origin and course of genito-urinary tuberculosis should teach us that our knowledge of this subject is yet in an imperfect state.

Litholapaxy, an operation which is becoming less and less popular, is given comparatively more space than it merits.

The volume closes with a chapter on syphilis which is a great credit to the work. The author states that in the vast majority of cases the methodical treatment of syphilis should begin at the time of the evolution of the secondary manifestations. "As a rule," the author states, "no good is produced by beginning treatment prior to this time." He lays stress upon the value of using all of the methods of introducing mercury into the system. The form which he recommends for internal medication is the protoiodide.

JAMES P. WARBASSE.

AN AMERICAN TEXT-BOOK OF SURGERY FOR PRACTITIONERS AND STUDENTS. Edited by WILLIAM W. KEEN, M.D., LL.D., and J. WILLIAM WHITE, M.D., Ph.D. Second Edition, carefully revised. Philadelphia: W. B. Saunders, 1895.

We welcome the appearance of the new edition of this valuable text-book, especially as the improvements upon the first edition are so marked. Among the changes for the better may be mentioned the

chapter upon fevers, the description of rodent ulcer, the operative treatment of fracture of the patella, and of fæcal fistula. Among the many new operations described are the osteoplastic resection of the skull, the Hartley-Krause method of removal of the Gasserian ganglion, Schede's modification of Estlander's operation, Witzel's gastrostomy, and Bassini's radical cure of hernia. The section upon appendicitis is very greatly improved, the McBurney method of gaining access to the appendix without dividing the abdominal muscles in non-suppurative cases, a minute account of the manner of covering the end of the stump with peritoneum, and the remarkably clear and sensible description of the indications for operation in the various forms of the disease quoted from White, making the chapter excellent. Murphy's button is figured and the method of its use is described, with a very sound although not enthusiastic opinion of its advantages and disadvantages. A section is added upon resection of the liver. The rest of the chapter on disease of the liver and gall-bladder needed no change, but we should have been glad to see eliminated the statement that gall-stones cannot be formed after removal of the gall-bladder, for it is not founded upon fact. The same is true of the assertion that most cases of fistula in ano are tuberculous. In the chapter on the surgery of the vascular system, the modern views are more correctly represented in the statement of the advantages of operative measures in the treatment of aneurism (by a misprint Delbet is spelt Delbel) than in the first edition, but we still meet among the arguments against the operation the possibility of suppuration of the sac and of the formation of a second aneurism at the seat of ligature—accidents which only sepsis cause, and sepsis is no argument against an operation. The infusion of saline solution for hæmorrhage also is not yet emphasized sufficiently, for it is now our constant and almost unfailing resource in that condition, and yet the uninstructed reader would infer from the text that transfusion of blood was as good. In the chapter on the genito-urinary tract, the diseases of the kidney need some improvement, especially the condition of pyonephrosis, which is so confused with hydronephrosis that it is difficult to gain any idea as to the real symptoms

or treatment of the suppurative condition, although it is such an important surgical disease. Tuberculosis of the testicle is another common disease which has been neglected, only eighteen lines being given to it.

The illustrations, good as they were already, have been much improved by changes and additions, and both have been made in well-directed attempts to add to the teaching value of the work. Some of the old cuts have been suppressed, others redrawn with considerable improvement in the artistic effect. Among the many new illustrations may be mentioned tubercular disease of the elbow (clinical), double subcoracoid dislocation of the shoulders, perineal dislocation of the hip, keloid (of the neck), depression in the head seven years after operation (for tumor of brain), a cut from Esmarch showing the operation for opening the mastoid antrum, macroglossia, Plate XIX (two illustrations of hernia), "distended bladder mistaken for an abdominal tumor," amputation at shoulder-joint by Wyeth's pins and rubber tubing (Keen), Macewen's method for compression of the abdominal aorta, and many more, especially in the description of the new operations. In the section upon the repair of fractures we note three instructive cuts showing the formation of callus, and in that on the brain the useful diagram from Krönlein showing where to trephine for extradural hæmorrhage. All of the borrowed cuts are credited to the authors in the titles, not in a list at the beginning of the book, as in the old edition,—a much more straightforward method.

A new section on malpositions of the uterus, thirteen pages in length, has been added, with numerous and instructive cuts.

While we have ventured to point out some improvements which can still be made (when is a book ever perfect?), we heartily congratulate the editors upon the advance attained in this revision of one of the most popular text-books of surgery.

B. Farquhar Curtis.

REMOTE CONSEQUENCES OF INJURIES OF NERVES AND THEIR TREATMENT. An examination of the present condition of wounds received 1863–1865, with additional illustrative cases. By JOHN K. MITCHELL, M.D. Philadelphia: Lea Brothers & Co., 1895. 12mo, cloth, $1.75.

Any one who has enjoyed the perusal of Weir Mitchell's original classic on Nerve Injuries will take up this continuation of the subject by his son with the liveliest expectations. In reality it, of course, to a considerable extent represents the work of both. While the topic is now less novel, this phase of it proves to have its share of interest.

Little attempt is made at a study of the pathological anatomy, but only of the clinical manifestations. A great amount of effort has evidently been expended in securing reports of distant cases, personally examining others, etc. While we often wish the facts might have been worked up more completely and with more satisfactory generalizations, yet any one who has had to do with these sensitive and suffering patients must have realized the great difficulty in securing exact data.

As Dr. Mitchell is aware, Pension-Office Reports are from a scientific stand-point decidedly unsatisfactory. The reasons therefor need not be specified.

The generally pleasant and easy style of writing and the author's conservatism in drawing conclusions are laudable features. Occasionally a clearer choice of words might have been made, as at top of page 147, "isolated," instead of "severed" nerves would have been less ambiguous. Or to say, as under Case XXXI, that the spinal canal had been opened because there was discharge of fragments from the body of a vertebra, seems scarcely warranted.

His study gives special details of fifty-two cases. It is, perhaps, in order for the reviewer to state the outcome in Case XLIII. This is one of stab-wound of the ulnar nerve with consequent neuritis tending to spread. At a subsequent operation over an inch was

excised from this nerve above the elbow. This has resulted in an eventual complete recovery in every way,—except, of course, for the local paralysis in the forearm.

WILLIAM BROWNING.

I. DISORDERS OF THE MALE SEXUAL ORGANS. By EUGENE FULLER, M.D., Instructor in Genito-Urinary Diseases in the New York Post-Graduate School. 8vo. 238 pp. Philadelphia: Lea Brothers & Co., 1895.

II. MANUAL OF SYPHILIS AND THE VENEREAL DISEASES. By JAMES NEVINS HYDE, M.D., Professor of Skin and Venereal Diseases, Rush Medical College, Chicago, and FRANK H. MONTGOMERY, M.D., Lecturer on Dermatology and Genito-Urinary Diseases, Rush Medical College. 8vo. 618 pp. Philadelphia: W. B. Saunders, 1895.

III. PATHOLOGY AND TREATMENT OF VENEREAL DISEASES. By ROBERT W. TAYLOR, M.D., Clinical Professor of Venereal Diseases at the College of Physicians and Surgeons, New York. 8vo. 1001 pp. Philadelphia: Lea Brothers & Co.

IV. A PICTORIAL ATLAS OF SKIN-DISEASES AND SYPHILITIC AFFECTIONS, in photolithochromes from models in the museum of the Saint Louis Hospital, Paris; with explanatory text by Doctors BESNIER, FOURNIER, TENNESON, HALLOPEAU, and DU CASTEL, Physicians to Saint Louis Hospital, edited and annotated by J. J. PRINGLE, M.B., F.R.C.P., of London—in twelve parts—Part I. Folio. Four plates, 28 pages. Philadelphia: W. B. Saunders, 1895.

I. The title of Dr. Fuller's book is misleading, since only a very small portion of the disorders of the male sexual organs are dealt with in its pages. A more just title would have been "Sexual Disorders in the Male due to Inflammations of the Seminal Vesicles." The key-note to the book may be found on page 58, where the author says, "It is in connection with the seminal vesicles themselves, in-

cluding their contents, their walls, the perivesicular tissues, and the ejaculatory ducts, that most of the pathological changes occur which cause disturbances in the sexual function. . . . The changes due to inflammation are the chief pathological factors in this consideration."

In this limited field the book is valuable and instructive, and brings views of sound pathology and rational treatment to many cases of sexual disturbance which have heretofore been vaguely classed as spermatorrhœa or sexual neurasthenia, and whose treatment has been too often fruitless for good, since it has been either wholly empirical, or has been based on pathological error.

In the earlier pages of the book the anatomy of the seminal vesicles is elaborately studied. The text is illustrated by many half-tone plates from photographs of dissections. These plates demonstrate well the limitations of the photographic process for presenting anatomical subjects. They are well printed, and are as clear as such plates can possibly be, but all parts of the subjects photographed are brought out with such equal fidelity that the non-essential portions obscure the essential details, while a common shade, varied only by patches of absolute blackness, renders the whole dissection, as it appears in the picture, vague and shadowy. For teaching purposes, crude diagrams, even, would be preferable to these photographs.

According to the author's experience the most frequent cause of seminal vesiculitis is gonorrhœa, this having been the origin in 60 per cent. of the cases observed by him. Next in point of frequency as a cause is tuberculosis; 30 per cent. of his cases having been due to this infection. The remaining cases are traceable to such causes as youthful sexual excesses, including masturbation; and in later life to unnatural sexual practices, such as the practice of "withdrawal," etc.

The existence of vesiculitis is to be ascertained by palpation through the rectum, whereby the tender distended sacs are brought into evidence, and the true nature of an affection, often confounded with rectal, prostatic, or deep urethral trouble, is established.

Treatment of the acute stage of the disease requires in many

cases only rest in bed and mild laxatives, with anodyne suppositories to relieve pain. After from ten days to two weeks a free discharge of pus into the urethra is to be expected, after which time generally two weeks more of confinement in bed are required to allow the parts to regain such a healthy condition that the rectal touch no longer elicits evidence of vesicular inflammation. The author has never found it necessary to open the suppurating vesicle through a perineal incision.

In the subacute and chronic forms of the disease the main reliance in treatment is systematic stripping of the vesicles whereby diseased secretions are expressed, inflammatory exudations are absorbed, and congestions are dissipated. These strippings are to be repeated at intervals of a week, usually; the treatment may require to be persisted in for from one to nine months, or longer, to secure its full benefits. The technique of this procedure is as follows: The patient, having a full bladder and standing with knees straight, bends the body forward at a right angle. Then the operator, assisting himself by counterpressure above the pubes, introduces the forefinger of one hand into the rectum and presses it on until its tip has passed well beyond the farther margin of the prostate. The distended bodies of the vesicles being felt, firm pressure is to be made upon them by the finger-tip, which is slowly and firmly drawn forward along the line of the organ. This process is to be repeated several times at each *séance*.

This treatment is contra-indicated in tubercular vesiculitis, in which cases it aggravates instead of benefits the trouble. Hygiene is the chief reliance in this form of vesicular inflammation.

A very brief reference to incision and extirpation of the vesicles is made. The author thinks that by the use of the stripping treatment the necessity for incising the seminal vesicles has been much lessened. Most of the reported extirpations have been for tuberculous disease, but the author prefers to rely on general hygienic and tonic methods of treatment, and would restrict extirpation to cases of neoplasm, and inflammatory disorganization.

The special field of surgical effort to which this book invites the

practitioner is not a very attractive one. Seventy per cent. of the cases of the form of disease described result from sexual vice. The peculiar manipulations recommended for its treatment, while not enticing, are still tolerable for an enthusiastic surgeon for an occasional attempt until he has established a diagnosis, but to keep it up as a regular practice for months is likely to put a strain upon his scientific ardor which few men will be likely to endure long.

II and III. These two books cover apparently the same field, the difference being only in the order in which the several topics are considered. Hyde and Montgomery begin with syphilis, and then pass to the consideration of gonorrhœal affections. Taylor begins with gonorrhœa and ends with syphilis, an order which perhaps is more in accordance with the eternal fitness of things, since it is the more usual experience of the venereal explorer. The first is a handbook for students; its statements are clear, concise, and condensed; the size and weight of the book is convenient for handling and study, and the print is very legible and easy to follow. The second is an elaborate treatise, more than three times the size of the first, a book for reference, a fountain of information, a guide for practice. In addition to venereal diseases, Taylor devotes chapters to such other disorders of the male genitals as cancer, elephantiasis, varicocele, and hydrocele.

Hyde is very clear and positive and yet judicially fair as to the part in the production of gonorrhœa played by the diplococcus of Neisser. He sums up his discussion thus: "(1) Gonorrhœal pus, or a pure culture of gonococci from such pus, produces gonorrhœa. (2) Pus free from gonococci, or a pure culture of micro-organisms found in such pus, does not produce gonorrhœa. (3) A slight subacute or chronic discharge containing a small number of gonococci may produce a true gonorrhœa, but a discharge of apparently the same nature, and containing diplococci that cannot be differentiated from gonococci, often fails to produce an infection of any kind."

Taylor is equally certain as to the relation to be assigned to the diplococci in the genesis of gonorrhœa. According to him acute gonorrhœa consists of "a violent invasion of a mucous membrane by

large masses of gonococci, which penetrate between the cells. The reaction on the part of the tissues corresponds to the intensity of the irritation excited by the micro-organisms in the soft and sensitive epithelium. The great mass of gonococci in the uppermost strata of tissues perish there from simple dissolution. Final healing is caused by the development of a protective covering of squamous epithelium in several layers, which forms a barrier which the gonococci cannot break through."

Not every diplococcus has the specific qualities of a gonococcus, however, and the discovery of such an organism in a discharge is not sufficient to establish the gonorrhœal character of the process which has given rise to the discharge. Taylor's view, while fully admitting, as has been seen, the part which the diplococci play in the genesis of acute gonorrhœa, is that, in the matter of chronic urethral discharges, the extreme persistence of the gonococcus in the urethra has been much overdrawn, due to overlooking the fact that the damage done to the urethra originally by the micrococcus has produced an exudative inflammation which remains long after the specific micro-organism has disappeared. In short, according to Taylor, after a gleet has lasted for some months, the gonococci are in all probability absent. This is a most comforting doctrine, but, if true, the exceptions must be very frequent, as is shown by the experience of numerous unfortunate young women who upon marriage find that the mucous membrane of the vagina and uterus is a most favorable culture-ground for the gonococci that still persist in the urethræ of the husbands. At the close of an elaborate historical and critical review of the researches of various observers as to the etiology of gonorrhœa, Taylor gives his opinion that while its chief pathogenic agent is the gonococcus, other micro-organisms may also give rise to urethral suppuration, sometimes as violent and as much complicated as true gonorrhœa, although the inflammations caused by the non-specific pus-producing microbes are usually milder in character and shorter in duration than those provoked by the gonococcus infection. He then proposes a conundrum for which he seems unable to furnish any satisfactory answer,—namely, this: Granted that a typical gonorrhœa with abun-

dant gonococci may result from coitus with a woman who has never had gonorrhœa and in whom the most careful and rigorous examination fails to reveal the gonococcus, where do the gonococci come from? As to the correctness of the terms of this postulate he is very positive. He says, "Let any one study these cases without bias or prejudice, and he will find that many times the gonococcus is absent from the female discharge, while the male has typical gonococci urethritis. . . . It is possible for a man to have a urethral discharge containing true gonococci which he contracted from a woman who never had gonorrhœa." But the question remains unanswered as to where the gonococci come from! Perhaps in future editions of the work a satisfactory answer may be given.

Hyde does not seem to be troubled about the gonococci in this particular connection. He contents himself with the simple statement that clinical experience furnishes some undoubted exceptions to the rule that a healthy man with a sound urethra does not acquire a urethritis from a woman with vaginal secretions which are not gonorrhœal. The medical sceptic, it seems to the reviewer, notwithstanding these statements, will still cling to the doctrine, *omnis gonococcus e gonococco!*

As to the treatment of gonorrhœa, Taylor exclaims that "much has been written about the prompt cure of the acute stage of gonorrhœa by means of copious injections, irrigations, and retrojections of antiseptic solutions, but when the results are judicially studied it will be seen that in the main they are little if any better, and sometimes they are worse, than those obtained by the older methods." In order, however, to make his chapter complete, he mentions or describes all the new methods of treatment, new drugs, and the more prominent of the new instruments which have been devised for urethral treatment, so that the reader may have an up-to-date view of all suggestions in this field.

This same fulness of statement as to current views and contributions to the literature of venereal diseases is exhibited all through the book. The author does not allow his own views, however, to be lost sight of, but very plainly and vigorously states them, manifesting

always a marked predilection for the older doctrines. Indeed, the author seems often to be somewhat of a reactionist in his views, and to be very loath to admit any advantage in the adoption of methods of practice based on new pathological data.

Those surgeons who have thought that they derived much benefit from a very free division of strictured points in the urethra, with distention of the whole canal to its full capacity, will take exception to the halting and conservative methods of dealing with strictures of the urethra advocated by Taylor, who is satisfied if he can restore a urethra to a calibre of from 25 to 28 F. Perhaps he is prudent in setting such bounds to the attempts of the general practitioner. The reviewer remembers that he was himself content with such results in the earlier years of his practice, but is quite positive that he now secures much more lasting and positive relief to his patients by the use of more radical measures for enlargement, not being content with securing the easy passage of sounds of a less calibre than from 34 to 40 F., according to the size of the organ.

The last half of this book is devoted to syphilis. The discussions of this subject in all its phases are full and scholarly; the views of recent writers are fully presented and subjected to the author's criticism. In the treatment of syphilis the author protests against the administration of specific remedies before the onset of the secondary period, and especially against resorting to any attenuated, low-grade, prolonged mercurial medication in the subsequent stages. Such methods of treatment he characterizes as "unscientific, irrational, and mischievous!"

The book as a whole is a compendious presentation of present knowledge in the subjects of which it treats. The inexperienced practitioner can be sure that in following its recommendations he will not be erring on the side of rashness; the older surgeon will find its statements of recent contributions to pathology especially valuable, while its recommendations as to therapeutic measures he can weigh in the balances of his own experience.

IV. The scope of this work is fully set forth in the title. When completed the purchaser will have perhaps fifty plates representing

subjects chosen from among the extensive collection of models which have accumulated in the Museum of the Saint Louis Hospital of Paris. The plates in this first fasciculus represent respectively lupus vulgaris, dermatitis herpetiformis, chancres of the vulva, and purpura hæmorrhagica. The characteristics of these several lesions are most excellently portrayed in these plates, and an unusual degree of success has been secured in the attempt to depict the shades of color presented in these affections. Colored plates, as a rule, are too vivid in their color effects. If succeeding fasciculi maintain the standard of excellence presented in this first part, a collection of great value will result. The descriptive text is furnished by Drs. Besnier, Fournier, and Foulard. It consists practically of clinical notes on the cases depicted in the plates. The work of the translator and English editor has been well done.

LEWIS S. PILCHER.

ANNUAL OF THE UNIVERSAL MEDICAL SCIENCES. Edited by CHAS. E. SAJOUS, M.D., and seventy associated editors, etc. Philadelphia, New York, and Chicago: F. A. Davis Co., 1895.

This well-known Annual appears this year in the same form as in the last few years. Since the removal of the editorial office to Paris, however, a gradual change in the department editors is noted. French, German, and English authors are taking the place of the Americans who drop out of the work. The only difference between the surgical form this year and last is in the department of surgery of the abdomen, where Bull and Coley, of New York, succeed Packard and Le Conte, of Philadelphia, merging the department of hernia, previously written by the former authors, into that of the abdomen. The chapter on traumatic neuroses is also omitted. This publication has come to be a standard reference book, and is valuable as a means of looking up a subject preliminary to an extensive study. In its present form, however, it can never take the place of individual investigation, because of the great condensation that is essential in bringing the different departments within the space allotted to them.

SAMUEL LLOYD.

TRANSACTIONS OF THE AMERICAN SURGICAL ASSOCIATION, Vol. XIII. Edited by DE FOREST WILLARD, M.D. Philadelphia: Wm. J. Dornan, 1895.

It will be observed that this is the largest volume of transactions that this association has yet issued, embodying, as it does, the papers and discussions presented before the association at the meeting held in New York, May 28, 29, and 30, 1895, under the presidency of Dr. Frederic S. Dennis.

A number of papers are presented upon the subject of cancer, its local pathology and treatment. The important and much discussed question of the treatment of hypertrophy of the prostate is discussed in two excellent papers. Such other subjects as are now receiving the best thought of the surgeons of the day are discussed in able papers. Among these may be mentioned the influence of ether narcosis upon the genito-urinary tract; the restoration of joint-function after fracture; wounds of the heart; cholecystectomy; immediate suture of the gall-ducts and gall-bladder after the extraction of stones; transperitoneal uretero-lithotomy; intraperitoneal suprapubic cystotomy for stone. The volume is one of the best edited and most valuable contributions to American medical literature that any of our great national societies produces.

JAMES P. WARBASSE.

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THE RELATION OF THE WEATHER TO FATALITY FOLLOWING SURGICAL OPERATIONS.[1]

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IT has long been supposed that there is a relation between the weather and the results following operation. All surgeons admit that cases do badly under certain weather conditions, but so far as I know no one has made a definite study of the subject with a view to locating the meteorological conditions which are most unfavorable.

The subject was brought most forcibly to my notice in November, 1892, when I lost a case unexpectedly and after a favorable prognosis had been given. The case was that of a man, the picture of health, and with an excellent personal history; his family was distinctly tubercular, but he had no evidences of the disease. He was brought to me by Dr. Trask, of Astoria, with a history of recurring attacks of appendicitis, and was then suffering with a mild attack. On consultation, it was decided to operate, and the appendix was removed on the evening of November 15, 1892; there being no pus, the wound was closed throughout, and he was put to bed in good condition. The man developed a pneumonia and died five and a half days later. At the time of death, the wound had completely closed, showing an uninterrupted reparative process at that point.

A reference to the weather records showed that at the time of operation the barometer stood at 29.848; humidity 98 per

[1] Read before the New York Surgical Society, February 12, 1896.

cent.; wind northeast, and it was raining heavily. Taking the average from the time of operation till death, I found the barometer registered 29.956; humidity 75 per cent.; wind east; weather variable.

The normal barometer at New York is thirty inches, and humidity is 72 per cent. On further study of the case, I decided that one must look principally to the barometric and humid indications, while the direction of the wind and character of the weather should be looked upon as contributing factors.

In order to present something approaching definiteness, and that there may be at least a slight foundation for discussion and future investigation, I have taken the records of Bellevue Hospital for the six months beginning January 1, 1895, and ending July 1, 1895, and compiled a list of those cases which died within nine days of operation. I herewith present the list, with the weather indications at the time of operation. The only correction I have made has been to group the causes of death more generally than must necessarily appear on the records. It should also be borne in mind that while this is the record of only one hospital, as there are four surgical divisions, each with three visiting surgeons, it represents practically twelve methods of operative procedure, and is really more valuable than did it comprise one surgeon's experience for a proportionately longer time.

A summing up will be found in table two, which gives the general average and total average, and also a comparison of the number of days of great humidity and the number of fatal operations per month.

A study of the following tables will at first appear somewhat confusing, for patients died when the barometer was high, humidity low, wind westerly, and weather clear; but a combination of the four favorable conditions presents itself only in four cases (9, 15, 16, and 23), and three of these died of sepsis, over which one would hardly expect the weather to exert much influence.

TABLE I.

No.	Disease or Injury, and Complications.	Cause of Death.	Interval between Operation and Death.	Date of Operation.	At Time of Operation.			Weather.
					Barometer.	Humidity.	Wind.	
1	Fracture of the skull; abscess of the brain.	Injuries.	4 days, 11 hrs.	Jan. 9, 1.15 P.M.	30.452	79	N.	Cloudy.
2	Compound fracture of left femur and rupture of popliteal artery.	Shock.	8½ hrs.	Jan. 22, 6.45 P.M.	29.616	69	N.-W.	Clear.
3	Rupture of bladder; fracture of fibula; extravasation of urine.	Injuries.	1 day, 12 hrs.	Jan. 24.	29.911	76	W.	Clear.
4	Cellulitis of the arm; delirium tremens.	Sepsis.	1 day.	Jan. 28, 11 P.M.	29.596	83	S.-W.	Cloudy.
5	Fracture of skull; laceration of brain; clot.	Injuries.	5 days, 17 hrs.	Jan. 29, 2 P.M.	29.930	92	W.	Clear.
6	Compound fracture of right tibia; amputation.	"	1¼ hrs.	Feb. 19, 7.30 P.M.	29.822	73	S.-W.	Clear.
7	Carcinoma of the neck; removal; later, forced ligature of external carotid.	Shock and hæmorrhage.	6 hrs.	Feb. 20, 9 A.M.	29.860	65	N.-W.	Clear.
8	Tubo-ovarian abscess; septic peritonitis.	Sepsis.	6 days.	Feb. 27.	30.050	57	W.	Partly cloudy.
9	Intestinal obstruction.	Shock.	23 hrs.	Mar. 23.	30.546	64	N.	Clear.
10	Compound Pott's fracture; syphilitic necrosis.	Sepsis.	7½ hrs.	Apr. 24, 2 P.M.	30.033	78	S.	Clear.
11	Strangulated hernia.	Pneumonia.	5 days.	Apr. 29.	30.293	100	N.-E.	Cloudy.
12	Sarcoma of axilla.	"	2 days.	May 4.	30.152	90	S.	Clear.
13	Fracture of pelvis; rupture of bladder.	Shock.	5½ hrs.	May 7, 3.30 P.M.	30.164	87	S.	Clear.
14	Gangrene of right middle toe; amputation; extension of gangrene.	Sepsis.	9 days.	May 9.	29.649	88	W.	Cloudy.
15	Phlegmasia dolens and cellulitis.	"	4 days.	May 17.	30.183	55	N.-W.	Clear.
16	Gangrenous umbilical hernia; nephritis.	"	2 days, 7 hrs.	May 22, 9.30 A.M.	30.100	65	. . .	Clear.
17	Fracture of skull; laceration of brain.	Injuries.	2 days.	June 2.	29.993	54	. . .	Clear.

TABLE I.—*Concluded.*

No.	Disease or Injury, and Complications.	Cause of Death.	Interval between Operation and Death.	Date of Operation.	At Time of Operation.			Weather.
					Barometer.	Humidity.	Wind.	
18	Compound fracture of tibia and fibula of both legs.	Injuries.	1 day.	June 3.	29.913	66	. . .	Clear.
19	Contusions of abdomen and intestines; laparotomy; anastomosis with three Murphy buttons.	Shock.	3½ hrs.	June 4, 8 P.M.	30.120	90	E.	Cloudy.
20	Fracture of base of skull.	Injuries.	3 days.	June 8.	30.345	64	N.-E.	Clear.
21	Appendicitis; abscess.	Sepsis.	9½ hrs.	June 9, 10 A.M.	30.188	58	N.-E.	Cloudy.
22	Gangrene of foot.	Shock.	6 hrs.	June 24.	29.978	81	. . .	Clear.
23	Multiple carcinomata of liver; laparotomy.	Disease.	6 days.	June 20.	30.006	68	S.-W.	Clear.
24	Femoral hernia; fæcal fistula.	Shock.	3 hrs.	June 24, 3 P.M.	29.956	79	N.-W.	Light rain.

TABLE II.

Causes of Death.	Time of Deaths, in Days.									Total Deaths.
	1	2	3	4	5	6	7	8	9	
Shock	7									7
Pneumonia		1			1					2
Injuries	2	3	1			1				7
Sepsis	3		1	1		2			1	8
	12	4	2	1	1	3			1	24

Causes of Death.	Number of Cases.	Average Barometer.	Average Humidity.
Shock	7	30.034	76½
Pneumonia	2	30.222	95
Injuries	7	30.052	72
Sepsis	8	29.976	69
Total Average		30.071	78½

TABLE II.—*Concluded.*

NUMBER OF DAYS WITH HUMIDITY ABOVE 90°, AND NUMBER OF FATAL OPERATIONS EACH MONTH.

Month.	Humidity.	Operations.
January	5	5
February	3	3
March	7	1
April	7	2
May	6	5
June	8	8
Total	36	24

Taking the averages, it will be seen that the humidity was highest with pneumonia and next with shock. Leaving out sepsis, the general average humidity is 81½ per cent., while that of shock and pneumonia is 85½ per cent. Humidity was below 72 per cent. in five cases of sepsis, three of injury, and three of shock.

The barometer varies greatly, and there seems to be no direct relation between its height and the deaths. It was above normal in three cases of shock, two of pneumonia, two of injury, and six of sepsis, and the total average is above thirty inches (normal).

In three cases in which the barometer and humidity were favorable (8, 20, and 21), the weather was cloudy in two, and the wind was northeast in two. A northeast wind and cloudy weather is looked upon in New York as forerunners of high humidity and possibly low barometer.

The third part of Table II is interesting as showing a rather direct relation between excessive humidity and the number of fatal operations, by months.

While the statistics I have given are too few by which to reach a positive conclusion, I think one may safely assume,—

(1) That of the weather indications, humidity is the principal one governing the outcome of operation cases, and that the barometer, wind, and weather must be considered in relation to it, and to possible changes they may indicate.

(2) That excessive humidity at the time of injury, whether operative or accidental, is a factor of no little importance in the consideration of the treatment and final result.

The questions that naturally arise next are, Why is high humidity so detrimental? How does it affect the body? It appears to me that the action is twofold.

(1) In reducing the amount of excretion of the products of metabolism by the lungs and skin. Expired air is loaded to saturation with moisture containing excrementitious material,—principally carbonic acid, but also ammonia and organic solids. If dry air is inhaled, the expired air contains 100 per cent. of moisture with its proportion of effete material. If the air inspired contains 90 per cent. of moisture, necessarily but 10 per cent. of the returning moisture is directly from the lungs. If the normal New York air contains 72 per cent., there is left for the lungs, as a means of elimination, 28 per cent. (with no allowance for difference of temperature). As this percentage is reduced, so a corresponding part of the lung function is interfered with.

So also with the skin which normally throws off excrementitious material which is increased in amount in dry warm air and naturally lessened in moist air. Consequently, excessive humidity interferes with the action of the lungs and skin as eliminators, and the excrementitious material remains to poison the system, or must be secreted and eliminated by other ways,—notably the kidneys,—thus throwing upon the system and organs, at a time when they can least bear it, a greater amount of metabolic products and a greater amount of work of elimination.

(2) Air is a poor and water is a good conductor of electricity. The more moisture the air contains, the greater its conductivity and holding power. Cold air usually means dry air, as the colder the air, the less moisture it can contain; air at freezing point being capable of holding only 2.1 grains per cubic foot, while at 98° F. it will hold 18.1 grains (Climate and Health, United States Weather Bureau). In cold, crisp, dry air, one feels invigorated and filled with surplus energy; in warm, muggy, moist air just the reverse. Is not this because, in the first case,

the electrical potential of the body is high and that of the air low, and, in the second, the potential and conducting power of the air is high, it taking from the body sufficient to equalize or more nearly equalize the potentials, leaving the body deficient, and, as the contact air is continually changing, there is a constant loss of electricity.

If the effects are so noticeable in the normal state, is it not possible that they are still more marked under conditions—such as operation or accident—which, reducing the vitality, causes a reduction of the capability for normal potential; and, under circumstances increasing the potential, capacity and conductivity of the air, with change from positive to negative, would we not have surroundings very favorable for a rapid, large, and continuous loss of electricity, *and the conditions resulting which we now term shock and collapse?* In support of this view, I would quote from the following authorities:

(1) Draper[1] states that "when the air is perfectly clear electricity is always positive, varying in amount with the height of the locality and the time of day. At sunrise the charge is feeble, it increases up to eleven o'clock, it then decreases until just before sunset, and reaches a second maximum a few hours after the sun passes below the horizon. These variations follow closely upon those of the barometer, and the finer the weather the better they are marked. With a clouded sky the electricity is sometimes positive, sometimes negative. It often changes in this respect several times in the course of the day."

Jenkin[2] says, "Sir William Thomson found that the potential of the air varied very rapidly near the surface of the earth. Thus he has observed a difference of potential between the earth and the air nine feet above it, equal to 430 volts in ordinary fair weather, and in breezes from the east and northeast as great a difference as this per foot of air. The potential is perpetually fluctuating, even in fair weather. The potential of the air appears to be generally positive in fine weather, and negative only during broken or rainy weather."

[1] Medical Physics.

[2] Electricity and Magnetism.

(2) Tillmann:[1] "By shock is understood a peculiar state of depression of the nervous system, which is apt to be excited reflexly by injuries involving a shaking up or contusion of the sensory nerves. Goltz's experiment: By repeatedly striking the abdomen of a frog there is produced a peculiar state of collapse, which can terminate fatally by cardiac paralysis, etc." "Fischer and König are right in recommending vigorous stimulation of the skin by sinapisms, electricity, rubbing the extremities, applying dry heat, etc. In fact, Goltz's beating experiment fails if combined with vigorous irritation of the sensory nerves of the extremities." All authors agree with the above, and this may be accepted as our present understanding of the condition, shock.

There must be an exciting cause,—the nervous disturbance resulting from the injury,—but may there not be a disturbance of electric equilibrium as well? Note the character of those who suffer it most readily; not the phlegmatic and the lymphatic, those of greater capacity and who do not give up electricity easily, but those of sanguine nervous temperament,—that is, those with small resistance and high potential, who, living at a high tension, feel the proportional loss more and really lose more in proportion. The young bear injuries well because their capacity and potential are high; the old, badly, because of low capacity and potential.

Depressed mental conditions, such as fear, despair, etc., would be accompanied by diminished resistance and capacity; while hope, joy, success, etc., would favor great capacity and potential. The symptoms of shock are easily fitted to what one might expect with a suddenly decreased amount of electricity,—diminished vital force, general depression, cold skin, loss of muscular tone, etc., while the treatment which has been accepted as best is that which will soonest raise the capacity of the body for and the quantity of electricity,—dry heat, electricity, stimulants internally, etc.

It requires a good deal of skill and instruments of great precision and cost to determine the differences of potential between the earth, air, and body, but the subject has seemed to me

[1] Principles of Surgery and Surgical Pathology, Rogers's translation.

so important to mankind and surgery that I have instituted experiments with a view to determining whether the theory I have given above cannot be verified by actual measurements.

How can we best counteract the influences of humidity? My answer would be,—

(1) By postponing operations of magnitude till the weather indications were most suitable. In a large hospital practice, were this done habitually, the work would very soon be in arrears; also, certain cases require immediate operation; but there are a large number of cases (those of disease and chronicity) in which operation might without detriment be postponed twelve, twenty-four, or forty-eight hours, or even for several days.

I would suggest that the weather returns and indications be obtained each morning, and, if unfavorable, those cases set for operation, which can be postponed, be held over till such time as the weather circumstances be more favorable.

(2) By drying the air. Those cases which require immediate operation and with unfavorable weather conditions, should be operated upon in, and afterwards kept in, a dry atmosphere. This could be done easily in a hospital, and comparatively well in a private house, by attention to windows, doors, etc., and elevation of the temperature.

(3) By raising the electrical potential of the air and of the body. The dry warm air supplied the operating- and reception-rooms will, in itself, serve to do this; further, the electrical potential of the room may be raised by the use of a static machine, and, supplementally, a small continuous current might be supplied the patient.

I wish to express my thanks to Mr. E. B. Dunn, of the New York Weather Bureau, for courtesies shown me, and to my staff at Bellevue Hospital for help in the compilation of statistics.

A NEW OPERATION FOR HYPOSPADIAS.[1]

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THE recent researches of Paul Reichel[2] confirm the theory maintained by many since the beginning of our century that the condition known as hypospadias is due to an arrest of development resulting in the failure of union between a portion of the sides of the genital groove (the closure of which forms the urethral tube) rather than to the rupture of a tube already formed. When this portion of fœtal development is arrested between the seventh and fourteenth weeks, the termination of the completed urethra occurs farther back towards the bladder in proportion to the shortness of the term during which embryonal constructive activity remains undisturbed. So that if arrest of the process takes place at the seventh or eighth week, the urethra is only completed as far as the perineum, while "glandular" hypospadias implies a stoppage of development as late as the fourth month. (Reichel.) Orth states that while hypospadias occurs once in every three hundred males, epispadias is noted only one one-hundred-and-fiftieth as often.

The frequency of the different forms is greater in proportion to the length of the completed canal. In other words, the least serious forms occur most frequently. Reichel maintains that balanic hypospadias is commoner than we can estimate, since the slight deformity, causing no inconvenience, does not drive the patient to the surgeon. I have seen a number of such cases in

[1] Read before the Chicago Medical Society, February 3, 1896.

[2] Archiv für klinische Chirurgie, XLVI, 740, and Die Entwickelung der Harnblase und Harnröhre, Würzburg, 1893.

the course of examinations for other conditions. The cases of hypospadias are divided into three categories, for the sake of convenience rather than because of a mathematical limitation of development at certain points. When the urethra ends at the lower part of the glans the deformity is called glandular or balanic hypospadias, while the other two forms are sufficiently explained by the terms *penile* and *scrotal*.

The technical difficulties in the way of surgically assisting

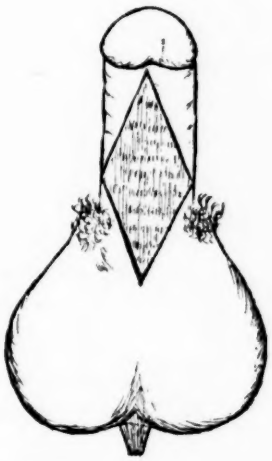

FIG. 1.—After Duplay. Straightening the penis by transverse incision.

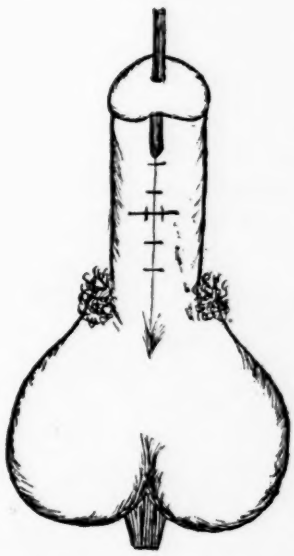

FIG. 2.—Duplay. Suture of the wound made for straightening the penis. The urethral canal has been completed through the glans.

nature in the development of the penis are numerous, and should be accurately understood in order to estimate the value of the different procedures adopted.

In balanic or glandular hypospadias the frænum is absent, and from its normal site the prepuce spreads backward upon the dorsum of the glans in a somewhat rectangular fashion. As the prepuce is not stretched over the glans, it is often much retracted, and in some instances has been altogether wanting.

Two important points apply to a description of all the forms of hypospadias. First, the organ is not only mal-developed structurally but quantitatively. The penis is always smaller than normal. Second, there is in all the penile and scrotal cases a simulation of the female type. Hence in penile and peno-scrotal hypospadias the organ is not only small, but is curved strongly towards the scrotum, and the skin covering the penis spreads down on each side upon the scrotum without a break, even the contour of the penis not being displayed, except when it is elevated forcibly. It must not be forgotten that the downward curvature

FIG. 3.—Duplay. Mode of forming the "balanic" portion of the urethra.

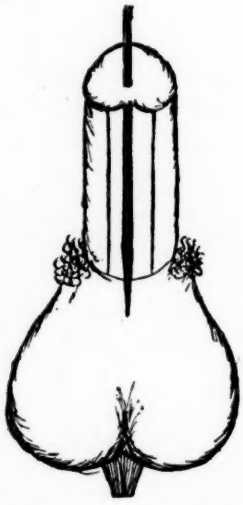

FIG. 4.—Duplay. The incisions for making the flaps for the penile portion of the urethra.

of the penis is largely due to lack of development of the corpora cavernosa.

The problem presented to the operator is manifold. First, to complete the urethral canal from the point where natural coalescence of the sides of the tube failed to the end of the glans. Second, to straighten the penis and release it from its moorings to the scrotum. Third, to properly adjust the skin upon the elevated penis by plastic methods.

Besides these anatomical objects, there are three physio-

logical requirements exacted of the surgeon,—both incidental to the anatomical indications. The first is to enable the patient to accomplish the generative act. The second is to make it possible for the individual to urinate without assuming a squatting position in order to protect his clothing. The third is to favor the development of the organ by the early establishment of its normal shape.

Before the present century the ingenuity of surgeons was devoted to the dilatation of the urethral canal, or to its discission

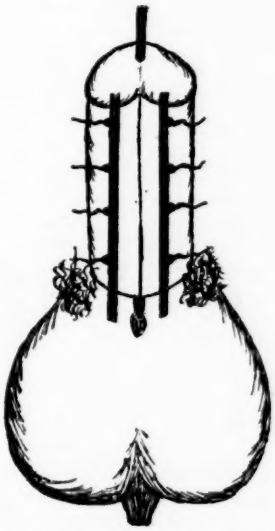

FIG. 5.—Duplay. Quilled sutures in place for maintaining apposition of the flaps.

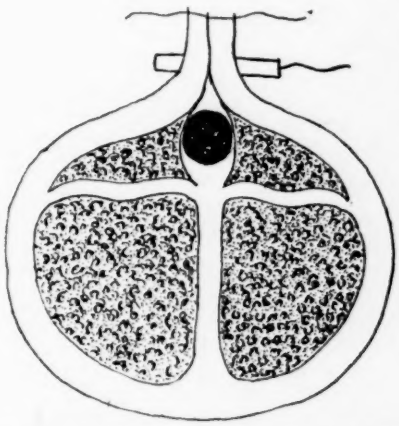

FIG. 6.—Duplay. Transverse section of the penis to show the arrangement of the sutures.

and to the adjustment of apparatus for the reception of urine in the extreme cases.

Since the days of Dieffenbach[1] a number of methods of dealing plastically with the difficulty have arisen, and I shall present a brief review of them from the point of view of an anatomical classification rather than that of historical development.

Assuming the existence of a penile deformity, we have,—

(1) The method by simple canalization.

[1] Dictionnaire encyclopédique de Médecine.

(2) That by denudation and suture.

(3) That by the use of penile flaps.

(4) That by taking flaps from the abdomen or scrotum.

(5) That by the combination of these fundamental methods.

The first of these methods was practised by Dieffenbach, who in 1838 perforated the glans with an ordinary trocar, the canula of which was carried down to the opening of the urethra and left in place until a permanent fistula was established. The method was impracticable, and, except in a very few simple cases,

FIG. 7.—Thiersch. Formation of a channel through the glans penis.

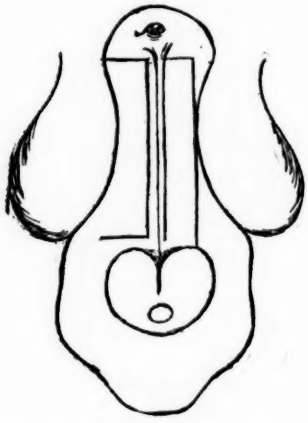

FIG. 8.—Thiersch. Incisions for raising flaps to form the urethral canal through the body of the penis. Epispadias is illustrated for convenience.

like that of Ripoll, in 1856, successes were only temporary on account of scar-contraction about the wound. The red-hot iron was used by other surgeons for the same purpose.

The first to use the method by denudation and suture was also Dieffenbach, who had one unsatisfactory result and scored one success. The great champion of this principle is Duplay, who has worked out an elaborate technique and has had a number of successes. This surgeon divides the operation into three

stages, the first attempting the straightening of the organ by making a deep transverse incision across the peno-scrotal fold, forcibly stretching out the penis, and then introducing transverse sutures. In this he followed Bouisson. At the same time, a canal is made through the glans by denuding two parallel longitudinal strips which are fastened together over a catheter or staff by means of sutures. The second operation consists in the completion of the canal from the glans to the opening of the natural urethra by making similar lateral longitudinal denudations and uniting the skin over a catheter by means of quilled sutures.

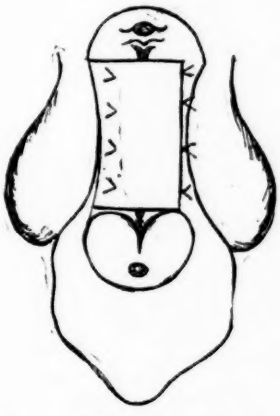

FIG. 9.—Thiersch. The flaps formed by the incisions of Fig. 8 are sutured.

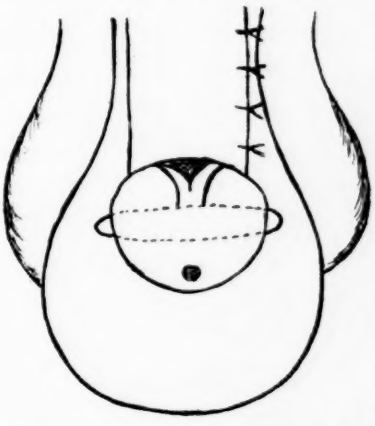

FIG. 10.—Thiersch. The dotted line shows the site of the incision for button-holing the prepuce.

The third step consists in the junction of the new canal with the normal urethra by the same general method, denudation and suture over a catheter which is introduced into the bladder to obviate the necessity for forcible urination. (Figures 1 to 6.) Krönlein uses a similar method. The rational method of using pediculated flaps of penile tissues is due to the inventive genius of Thiersch.[1] (Figures 9 to 12.) It was he who established the principles that the urine should be temporarily directed away from the site of operation, and that the flaps used should be applied to denuded surfaces so broad that primary

[1] Archiv für Heilkunde, 1869.

union would be favored to the utmost, and that these flaps should overlap one another with their bases on opposite sides of the penis, so that the transplanted tissue would be nourished from both sides, and thus the formation of fistulæ be afterwards avoided. The first step in his operation is the establishment of a perineal urinary fistula. At the same time a urethral canal is formed through the glans penis by the method already mentioned as being practised by Duplay, who imitated Thiersch. The second step consists in the formation of a tube along the main body of the penis by means of two rectangular flaps, the one

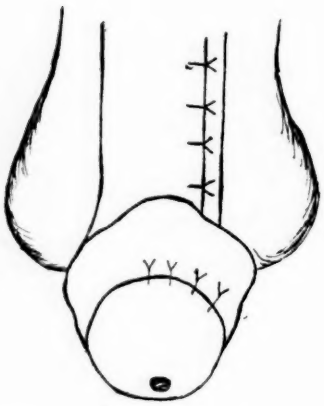

FIG. 11.—Thiersch. The glans penis is drawn through the opening made in the prepuce. Sutures are placed.

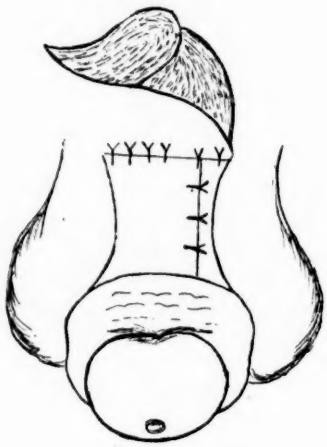

FIG. 12.—Thiersch. The opening leading into the bladder is closed by flaps from the pubes, thus completing the urethra.

having its base along the edge of the urethral groove, the other along the side of the penis. The first flap when turned over and fastened down with a few sutures makes an epithelium-lined canal, while the second flap covers the denuded surface, closing in the new-formed urethra. The third act consists in the union of the penile and balanic portions of the new canal by perforating the prepuce, which is drawn over the glans in such a way that its denuded edges can be sutured to the freshened borders of the opening between the two canals. The last act consists in

the closure of the opening between the normal and the new urethral channels by means of somewhat similar flaps.

A flap operation belonging to the same general class was devised by Dr. James Wood, of New York, who carried the prepuce around to make a part of the new canal.

The fourth method in my classification—by abdominal and scrotal flaps—was studied by Bouisson, Moutet, Nélaton, and Dolbeau. But though ingenious, their plans are too imperfect to give results comparable with those of Thiersch, and have in consequence fallen into disuse.

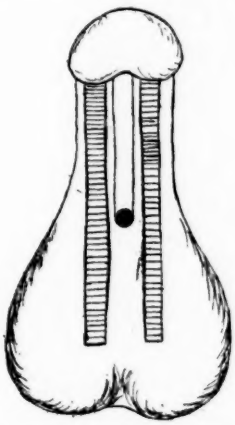

FIG. 13.—Landerer. Denudation of two strips on the penis and scrotum.

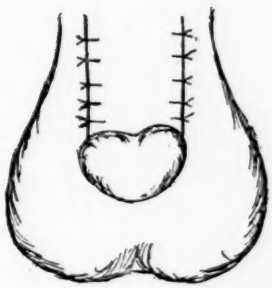

FIG. 14.—Landerer. The denuded surfaces of Fig. 13 are approximated and sutures introduced.

Rosenberger[1] has recently devised a plan by which flaps may be taken from the scrotum in hypospadias and from the abdomen in epispadias with some prospect of success. Rosenberger operated upon a case of epispadias in a baby of two and a half years and obtained a success.

Landerer[2] (Figures 13 to 16) published in 1891 an account of a case of hypospadias to the treatment of which he had adapted the method of Rosenberger, taking his flaps from the scrotum. He first denuded a long strip on each side of the ure-

[1] Deutsche medicinische Wochenschrift, 1891, p. 477.

[2] Deutsche Zeitschrift für Chirurgie, 1891, p. 32.

thral groove, beginning at the glans and extending well down upon the scrotum. He then turned down the penis upon the scrotum, to which he fastened it by sutures, uniting the denuded surfaces in such a way that a tube was formed between the under surface of the penis and the scrotal skin. After several weeks the penis was loosened from the scrotum in such a way that a flap was made, by the use of a little scrotal skin, to cover the denuded surface.

Bidder[1] published a little later an account of a case in which the procedure of Rosenberger was modified to suit hypospadias

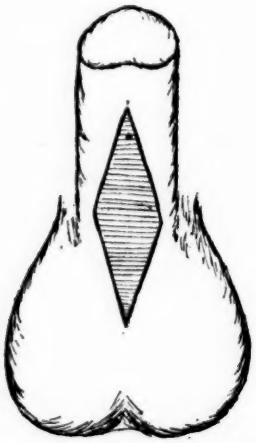

FIG. 15.—Landerer. The penis, having grown fast to the scrotum, is liberated by a transverse incision below the plane of the new urethra.

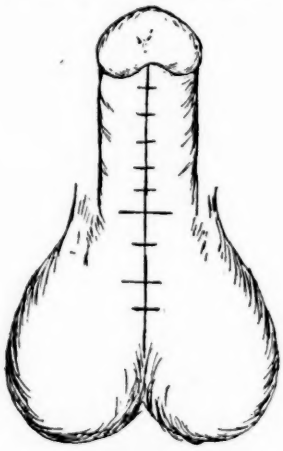

FIG. 16.—Landerer. The wound shown in Fig. 15 is closed by transverse sutures.

in a somewhat different manner, although the principle remained the same. The first operation, having for its object the attachment of the penis to the scrotum was not wholly successful on account of erections, and the penis failed to unite over a large part of one side. The second operation, for the closure of the defect and for the separation of the penis from the scrotum, was partly a failure, because of œdema, which caused gangrene of the tip of the flap, the slit at the side of the penis remaining open. The third operation was a denudation of the edges of the fistula

[1] Deutsche medicinische Wochenschrift, 1862, XVIII, p. 208.

with suture. The fourth operation was to straighten the penis. The result of a fifth operation, to close the lateral fistulæ which still existed, was not given.

Having been more favorably impressed with the principles upon which the operation of Thiersch is based than with those of other operators, I used that procedure in the first two cases of hypospadias which I treated. The first case was that of a boy of some twelve years of age, who had penile hypospadias, the urethra ending at a point about one-third the distance from the peno-scrotal angle to the apex of the glans. Although too

FIG. 17.—Illustrates somewhat diagrammatically the case of C. R.

much was attempted in the first operation, the net result was a good tube through the glans and a partial new-formed tube through the penile body. A second operation by the use of Thiersch's flaps partially closed the fistula, and, as the patient could pass a good stream of urine through the new urethra by compressing the fistula with the fingers, further operative measures were declined.

The second case was that of a young man, some twenty-three years old, who had a deformity of the same kind and degree. Similar methods were tried, a catheter being left in the

bladder through the new urethra. The results of two such attempts in this case were unfortunate. The tissues swelled to such an extent that great tension was placed upon the stitches, which tore out. And in the second operation the larger flap was lost by sloughing due to tension. The patient declines further interference.

Discouraged by this failure, I determined to try a new method in my next case. The method which I have devised belongs to subdivision five in my classification, since it is a combination of canalization with flap-formation.

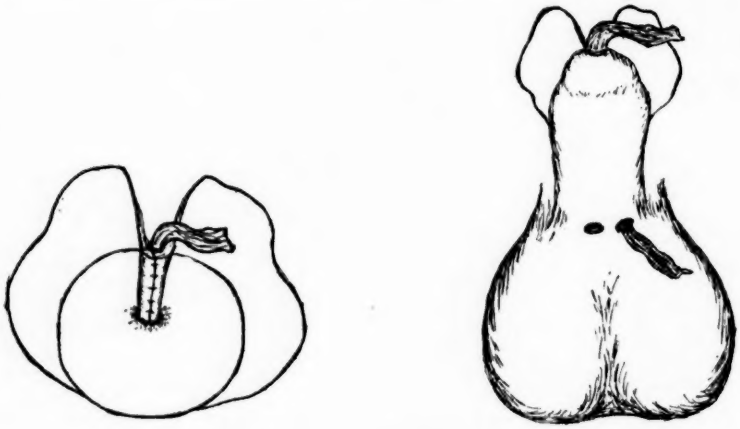

FIG. 18.—The two figures illustrate the formation of a preputial lining for the tubular incision through the penis.

C. R., a large, healthy boy of only fourteen months, was brought to me in July, 1895. He was devoid of deformity except for a penile hypospadias, the urethra opening at the peno-scrotal angle. The organ was much smaller than normal, and was tightly held down to the scrotum by the skin, which passed over the penis and down over the scrotum in a way simulating the covering of the clitoris, which passes down smoothly over the labia majora. The corpora cavernosa were also imperfect at their lower part, increasing the curvature.

It was explained to the mother that the operation must proceed by a series of steps, the number of which could not then be told; and it was definitely agreed that, unless the child's health failed, the opera-

tions should be continued until the penis was brought to a satisfactory state.

The first operation had for its object the formation of a canal through the glans and body of the penis, as far as the end of the normal part of the urethra. To accomplish this, I determined to make a channel through the penis and line it with a pedunculate flap of skin taken from the prepuce, the side of the penis, or from the scrotum. The source from which the skin was to be taken was not decided until the child was anæsthetized. I then raised and carefully examined the prepuce, which could not be done while the child was awake, and found, as I had hoped, that when the quadrangular fore-

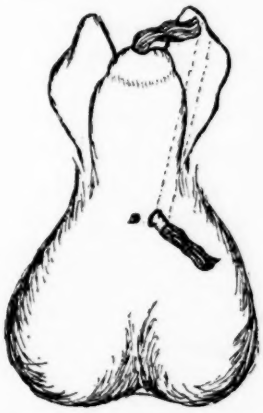

FIG. 19.—The dotted lines indicate the site of the skin-flap used to line the urethral incision when the flap was introduced from below upward.

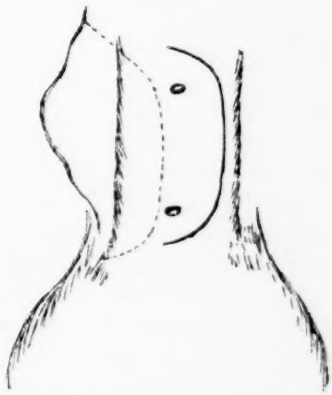

FIG. 20.—Illustrates schematically the closure of the openings left after the formation of the penile and glandular channel.

skin was held up between the eye and the light, not only the larger but even the most delicate blood-vessels could be seen and followed out almost to the edge of the skin. I then took a thin knife, transfixed the foreskin at one side of the largest blood-vessel, and cut through the skin in a line parallel to the vessel whose branches spread out like the limbs of a diagrammatic tree, or like the ribs of a lanceolate leaf. A similar cut on the opposite side of the vessel liberated a generous flap clad on two surfaces with epithelium and supplied with a pulsating artery in its pedicle. I then split the extreme edge of the flap transversely, and, without further cutting,

lest the blood-vessel be injured, the two epithelial surfaces were drawn together over a little roll of iodoform gauze, leaving the denuded surface of the flap outward. In this position the flap was maintained by means of a catgut continuous suture holding the epithelial edges together. It will be understood that I then had a living tube of tissue lined with epithelium enclosing a roll of gauze. I then transfixed the penis from the apex of the glans to the opening of the urethra by means of a narrow cataract knife, the plane of the incision lying in a sagittal direction. By means of a suture fastened into the gauze the flap was then pulled through the penile opening from the apex of the glans backward to the end of the normal urethra, where it was fastened. This procedure, though requiring so much space for its description, was easy of execution and was completed in ten or twelve minutes. At the same sitting the penis was incised transversely at the peno-scrotal angle and a few sutures applied transversely to straighten it. The opening of the normal urethra was enlarged at the same sitting. The flap lived and grew fast to the penile tissue, forming a good channel through the glans. Unfortunately, it was found to have retracted somewhat at the second operation, after about three weeks, and I regretted I had not made it *a third longer* than the opening in the penis, just as I had anticipated scar-contraction by making it a third wider in diameter than the normal part of the urethra. The new tube, at the time of the second operation, was found to end blind near the end of the normal part of the urethra, and the object of the second step was to make good this defect. This gave opportunity to take a flap from the skin at the side of the penis. A quadrangular strip of skin was loosened on three sides, the base lying very close to the end of the normal urethra, and being directed backward towards the scrotum to provide a blood-supply. A roll of iodoform gauze again served to maintain the cylindrical shape of the flap, which was drawn through a perforation made with the cataract knife through that portion of the penis which had failed to remain patent after the first operation. The base of the first flap was severed close to the new meatus urinarius, and the character of the blood-supply was demonstrated by the smart spurting of blood from the artery. The second operation was a complete success, the new tube being capacious and not surrounded by scars. The third sitting was utilized in an attempt to close the opening existing between the two parts of the urethra. Flaps were made somewhat after the Thiersch plan, but the operation failed on account of swelling, which

was caused by the attempt to raise the whole penis by making a circular incision about its base and suturing it higher upon the pubes. The stitches pulled out and the flaps fell apart.

At the fourth sitting large and well-adapted flaps were raised and applied as follows: on the left side of the opening a rectangular flap was loosened on three sides, the pedicle being nearest the fistula. The tag of prepuce remaining on the right side was then converted into a flap with a good base, and spread over the first flap as indicated in Fig. 20. At the same time, having been previously so much annoyed by the passage of urine over the little wounds, I button-holed the urethra from the perineum, and, after passing a small soft catheter into the bladder, fastened it with a stitch.

A fistula remained after the healing of these flaps, although of course its dimensions were much less than those of the former opening. The child was anæsthetized for the fifth time and the fistula closed by denudation and suture. Healing took place so smoothly that the catheter was removed from the bladder, and the urine passed in a good stream through the new channel. No tissue had been sacrificed or lost during all these manipulations, and as some tags of preputial tissue had been intentionally left, to be used if needed, the child was anæsthetized once more, and they were clipped off. The penis at this time presented an extremely good appearance, looking exactly like a normally developed organ, except for the absence of the prepuce, the presence of the scars on its lower surface, and the smallness of the organ. I regret to say that after the patient went home two fine fistulæ made their appearance upon the under surface of the penis. They are so small that I believe they will close under the application of strong caustics.

The various operations in this case were spread over a period of six months. It will be seen that in this operative procedure we have not only a technical novelty, but a *new principle* in the construction of epithelium-lined tubes,—viz., the canalization of the part by incision, and the lining of the summarily constructed tube with an invaginated tube of tegumentary material provided with a nutrient pedicle. In the treatment of epispadias (to which the principle is equally well adapted) and hypospadias the flap may be taken from the prepuce, the side of the penis, the scrotum, or the abdominal wall, although the last two sources have not as yet been tried.

The case reported, being the first in which the method was applied, required a larger number of operations than will probably be the case hereafter, since the first flap was not made long enough.

It will be seen that my method falls under the fifth heading of my classification of these operations, since it is a combination of canalization and flap-forming.

Obviously, we have not reached the acme of technique in the treatment of these deformities. But some propositions in criticism of what has been done may stand. Certainly no one at the present time believes that the simple canalization of Dieffenbach can be of practical service.

The method of denudation and suture, even as perfected by Duplay, cannot be compared with Thiersch's method, since even Duplay does not claim to surround the staff or catheter with a complete internal investment of epithelium. Rosenberger's method is ingenious and interesting. But the experience of Bidder, who had very great difficulty in obtaining union upon one side of the penis, would prevent us from entertaining extravagant hopes for this method. Bidder's commentary upon the operation is interesting. He says that *a priori* the operation appears not only rational but easy. In practice there are many difficulties in the way of getting the penis to unite to the scrotum. For the wrinkled, yielding skin of the scrotum must be pretty strongly stretched to be freshened. But this stretching causes a wrinkling of the wound edges by contraction of the scrotal muscles after the stitches are applied.

The fate of the hairs implanted in the urethra from the scrotum is worth considering. Bidder thinks they will grow out and project from the meatus.

The age of my patient deserves comment, inasmuch as the child is the youngest among the cured cases of which I have knowledge. I fully agree with Duplay in thinking that the earlier the operation is done the better for the development of the penis. An additional advantage lies in the fact that the child operated upon early does not remember the distress of repeated administrations of anæsthetics, and, besides, does not

have the operation to dread in future. It would seem that the physiological activity of children's tissues would favor the healing of the wounds required.

I must testify to my confidence in the value of deflecting the stream of urine away from the site of operation, which can nowadays be accomplished with such trifling difficulty by the perineal button-hole method.

In "step operations" it is a mistake to undertake too much at once. But this is a lesson all plastic surgery teaches. It is equally important to screw up the courage of the prospective patient or his friends as high as possible by a warning that a number of operations are required, usually extending over several months.

The operation which I present seems to me to offer the following advantages:

(1) It is easy of execution, not requiring a large number of accurately introduced sutures.

(2) The prospect of a primary union of the tissues is increased by the fact that the blood-vessels of the flaps are well preserved.

(3) Fistulæ are not likely to form.

(4) The new urethra is well supported by the surrounding tissues.

SUBPERITONEAL TISSUE.

By BYRON ROBINSON, M.D.,

OF CHICAGO.

THE peritoneum itself consists of a single layer of flat endothelial plates so joined at their edges that they make a continuous membrane. This membrane is so thin that one cannot feel perhaps five or six layers between the fingers and thumb. It is so thin and transparent that very beautiful and perfect microscopical views of structures can be secured by taking the membrane from a recently-killed animal and mounting it in glycerin without any preparation whatever. (Fig. 1.) All parts of the peritoneum, except the shiny, slippery, endothelial plates, its covering shingles, will be considered subperitoneal tissue. The subperitoneal tissue consists of (*a*) fibrous tissue, (*b*) elastic tissue, (*c*) areolar tissue, (*d*) wandering tissue-corpuscles, (*e*) fixed tissue corpuscles, (*f*) various kinds of cells, as vacuolate, branched, and fibrillar cells. Now this subperitoneal tissue differs in the quantity of the above elements it contains according to the location from which it is chosen. We will choose a small bit of the subperitoneal tissue from the side of the psoas muscle just beneath the peritoneal membrane. Place the bit of tissue on a glass slide in a drop of water and tease it well with a couple of pins, after which absorb out the water and place a drop of glycerin on the under surface of a cover-glass in which to mount the specimen. Now begin the microscopical search. The first thing to note is bundles of fibrous tissue,—tens of thousands of fine strands mostly existing in wavy bundles of variable thickness. This is known as white fibrous tissue. The wavy bundles are composed of silky fibres, so very fine that it requires a high power to see them. If one does not tease these subperitoneal tissues, the bundles run quite parallel, though they be wavy. But

teased, the bundles and fibres show a confused mass. The fibres interlace, cross each other, pass under and over, and present a tangled net-work. Non-teased, it presents dense fasciæ. Again, by careful study with the microscope, one can make out that these various wavy bundles are representative of different planes

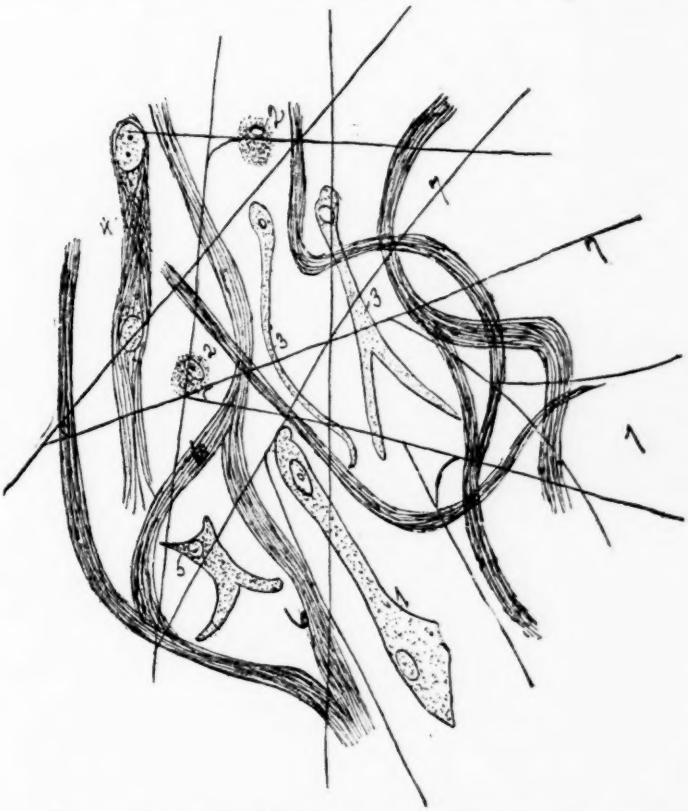

FIG. 1.—Drawn from human subserous tissue near psoas. It was teased a little, but did not break up the elastic mesh-work which forms its bed. 1, branched cell with two nuclei; 2, 2, granular cells; 3, 3, branched cell; 4, fibrillated cell; 5, branched cell with nucleus; 6, white fibrous bundles; 7, 7, elastic fibres.

of tissue. This accords with the gross anatomy, for one can split the subperitoneal tissue into many thin shiny planes. These shiny planes of mesoblastic tissue resemble the peritoneum. (Fig. 2.) The "white fibrous" subperitoneal tissue serves as a

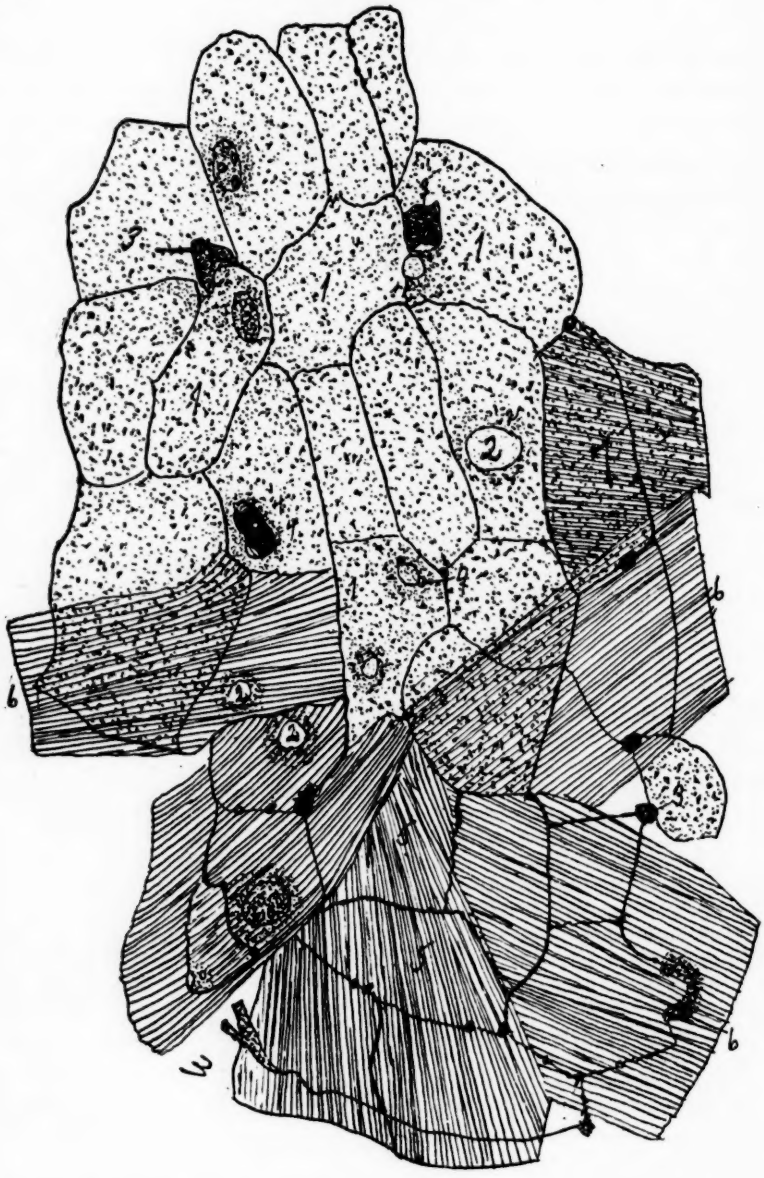

FIG. 2.—Drawn from omentum majus of a boy, two years old (oc. 2, obj. 8a Reichert). Part of the endothelia was pencilled off. Where some of the endothelia were pencilled off, (7) there is a kind of pepper and salt condition, albuminous precipitate of silver. Also the interendothelial lines on the pencilled portion show black dots. 1, 1, Endothelia non-pencilled; 5, 5, places where the endothelia was pencilled off; ag. No. 3, ½ per cent. applied; 6, 6, 6, bundles of subserous tissue or trabeculæ; 2, 2, 2, nuclei; 4, 4, 4, intra-endothelial stomata or precipitated matter; 3, 3, 3, stomata vera. This drawing lies adjacent to a field of regular endothelia, among which are innumerable stomata vera.

bed and support for vessels and nerves. It holds them in their course and protects them from injury. There is no place in the body where white fibrous tissue can be more beautifully observed than in the subperitoneal region. It is almost primitive in its perfection. The fibrils in the subperitoneal tissue are very long. In microscopic specimens the bundles reach from one side of the field to the other. Klein estimates them several inches long. The bundles are held together by an albuminous substance, semisolid, which on boiling results in gelatin. White fibrous tissue in the peritoneum presents two varieties: (*a*) One variety is found especially in the omentum of man and dog and cat. It may be designated as reticulated fibrous tissue. The omentum is fenestrated. Holes appear in the omentum at varying periods after birth, and the fibrous tissue remains in wavy reticulated bundles, while large, clear spaces exist between the bundles. In these irregularly-shaped spaces no tissue of any kind exists. It has all been absorbed away. The process of atrophy is not well understood. I noted that this form of omental fenestrating begins in the human being before two years. The reticulated bundles of fibrous tissue in the omentum are all entirely wrapped with endothelial cells, so that no fibrous tissue existed uncovered. The reticulated fibrous tissue is illustrated beautifully on young puppies or young children. (*b*) The other form of white fibrous tissue in the peritoneum exists in wavy bundles of varying size which interlace with each other in all directions and planes. The only difference in the two kinds of fibrous tissue in the peritoneum consists in its location and arrangement. The fibrils are white, and though they lack extensibility or elasticity in the ordinary sense, yet by teasing and stretching the bundles fly back or recurl into wavy lines. (Fig. 3.) The nature of the silky white fibres makes them an effectual support of adjacent organs. Are these long, silky, fine fibrils the drawn-out processes of cells or the condensed, homogeneous, semifluid portion, primitive cell processes? It may also be noted that subserous white fibrous tissue exists chiefly in membranous planes or fasciæ. It is easy to secure these membranous planes or mesoblastic, subserous tissue by snipping out pieces from the broad ligament or along

the psoas muscle and then to place the portion of tissue in water. As it swells up one can move it to and fro, when fine flocculent portions of extreme thinness may be seen floating in the water. These fine parts, single planes, can be snipped off with sharp scissors and immediately mounted in a drop of glycerin. I have examined with special care the subserous tissue in woman, and it can be obtained teased or not teased in the most typical condition. The white fibrous tissue in the broad ligament and

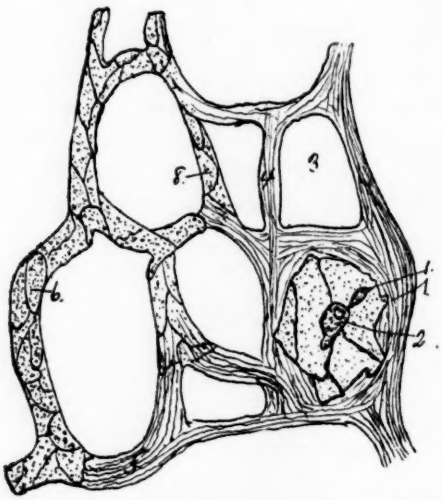

FIG. 3.—Sketch made from omentum majus of a boy two years old. Ag. No. 3, ½ per cent. applied. It is already well trabeculed and reticulated. Part of the trabeculæ are covered with endothelia, 8 and 6; 5, trabeculæ of subserous tissue not covered with endothelia; 3, space absorbed,—*i.e.*, the endothelia and subserous tissue have atrophied completely; 1, the group of 6 endothelia shows a stoma verum. It shows the trabeculated condition at two years old.

adjacent to the bladder is rich and abundant. The fibres, if not teased, run quite parallel in the same fine thin planes, but if the tissue is teased out, the fibres show a dense mesh-work, a confused mass. Sometimes a long bundle of fibres may be seen as straight as an arrow passing across the whole field, but generally the silken, fibrous strands are wavy, owing no doubt to the rough handling. The amount of white fibrous tissue situated around the urino-genitary apparatus is absolutely enormous, so far as

numbers of strands and bundles are concerned. The mobility of the genito-urinary organs is accounted for by the excessive amount of subserous tissue. These organs rest on beautiful beds of white areolar tissue which resemble newly-fallen snow or soft eider-down. (Fig. 4.)

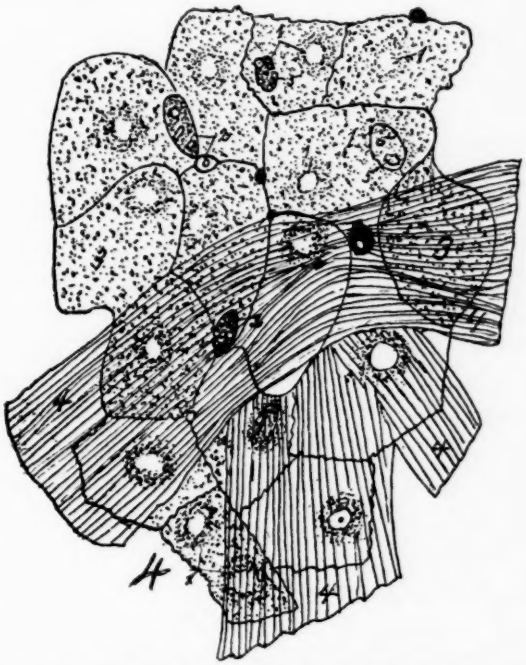

FIG. 4.—Drawn from boy's omentum majus, two years old. Ag. No. 3, ½ per cent. applied and partly pencilled. This figure is drawn close to a field which has enormous-sized endothelial cells. Where the endothelia are brushed off, the interendothelial lines are nearly all left undisturbed. 1, 1, Nuclei, some endothelial containing a double nucleus; 2, 2, stomata vera; 3, endothelia; 4, 4, 4, 4, trabeculæ of three different planes; 5, 5, spots in the nucleus,—nuclei.

Note how endothelia vary in size and outline in this omentum majus of the same individual.

Among older histologists, it is interesting to note the strife as to what is the essential element of a serous membrane,—viz., (*a*) endothelium, (*b*) fibrous tissue, or (*c*) elastic tissue. (The other variable elements they had not discovered or perhaps interpreted.) Bichat, who only lived thirty-one years (1771–1802),

recognized the independence of serous membranes. He owed his suggestions to Pinel. Valentine (1810–1883) discovered the endothelium. Some claimed that the serous fibres are the essential characteristic of the peritoneum, while others say that it is the elastic fibres, and still said some, "it is the endothelium." In 1851, Luschka (1820–1875) claimed the essential of the peritoneum to be "serous fibres,"—*i.e.*, the white fibrous bundles. How great men grope when in the dark, when microscopic light does not shine! But in the '40's came the sharp-eyed Henle (1809–1885), who saw things through a microscope, and said the essential constituent of the peritoneum is the endothelium, and his remarks remain yet unchanged.

The white fibrous connective tissue of the peritoneum is characterized by pale, water-colored fibres, by sharp though dark-colored contours. The fibre has generally a straight course, sometimes it has wavy or more rarely a sinuous outline.

So far as I have examined, they are present everywhere in the peritoneum. They lie embedded in different planes, and the fibres of the same plane run quite in the same direction. The fibres of the various planes cross each other at all angles from 0 to 180 degrees. The interlacing fibres may make a wide mesh-work or a mesh-work so thick and dense as to be opaque to the microscope. Luschka says the thickness of the fibres varies from .001 millimetre to an immeasurable fineness. I have noticed that the fibre is so fine that the addition of several hundred diameters to the microscope makes scarcely any perceptible changes; even when a single fibre traverses most of the microscopic field and finally divides into two, but little change in thickness may be observed with 400 diameters. (Fig. 5.)

The quantity of fibrous bundles varies in different portions of the peritoneum. They are most numerous where they are needed. For example, where much motion is required, as adjacent to the genito-urinary organs and small intestines, and around contracting and expanding vessels, the silky strands of fibrils are very numerous and abundant. The physical properties of the white fibril of the peritoneum, then, are non-elasticity and slight expansibility. It runs in parallel courses of bundles or

threads of almost immeasurable fineness. It forms thin planes, a net-work of broad and fine meshes, and the fibril anastomoses with others at very varying angles. The wavy, sinuous, and confused meshes of fibrils, generally seen through the microscope, are no doubt due to trauma and reagents; the limitations of the white fibril, that of subserous tissue,—*i.e.*, from the membrana limitens

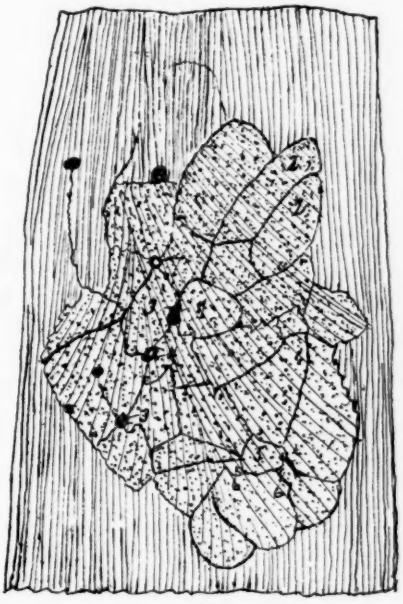

FIG. 5.—Drawn from omentum majus of a boy, two years old. Ag. No. 3, ½ per cent. applied. Part of the field was pencilled, and the endothelia are partly gone, showing the subserous tissue. Ground substance with no endothelia; 2, 2, endothelia; 3, 3, closed stomata vera, black dots; 4, 4, open stomata vera; 5, group of seven endothelial cells; 6, 6, shows two portions of cells almost constricted off,—*i.e.*, into additional endothelial cells; 7, shows another group of endothelia, six in number; 5 and 7 are likely stomata in stages of development.

to the bed-structure of the subperitoneal tissue. The chemical characteristic of the white fibril is that certain reagents, as acetic acid, make it swell and lose its distinct contour. The fibril becomes more visible and can be examined in different relations. Boiling the fibril produces gelatin. Potassium and sodium salts also affect this fibril, as well as some other reagents, as aniline

dyes. Microscopically, the fibril cannot be seen in too bright a light. To stain with carmine aids to see certain matters, but the most natural method is to mount fresh subserous tissue in glycerin. (Fig. 6.)

The second predominant element found in subperitoneal tissue is the elastic fibre. I have examined this in a cat, dog, frog, rabbit, and man. The elastic fibres are easy to recognize by their straight course and wide-meshed net-work. The elastic fibres are highly refracting, and have a distinct and sharp outline.

FIG. 6.—A sketch of some elastic fibres after teasing from human subserous tissue near psoas, forty-eight years old; thirty hours after death mounted in glycerin (oc. 2, obj. 8a, Reichert). In human subserous tissue the elastic fibres are very numerous. The teasing tore up the attachment of the base of the fibres, and hence they are irregular.

They are homogeneous and possess a uniform width throughout their length. A peculiar triangular outline may be observed at the junction of the fibres. Of course, a difference in thickness of the fibres may be observed where an elastic fibre branches off from a bundle. The elastic fibre may take a curved or wavy course, but the curves are generally wide and regular. The waves are not short or undulating like white fibres. (Fig. 7.) The elastic fibres anastomose in reticulated manner. The meshes or net-work may be quite small or very large. The mesh-work is

very strong and small in the rabbit. The mesh-work of elastic fibres is fine, dense, and enormous in quantity in the subserous tissue of the human ligamentum latum. If the elastic fibres are loosened from their attachments by trauma, as, for example, by teasing, they assume a curled-up appearance. The broken ends will curl up like a hook and show a very irregular looping. The elastic fibres are so dense and numerous in the mesentery of a rabbit that it looks like reticulated or adenoid tissue. So far as

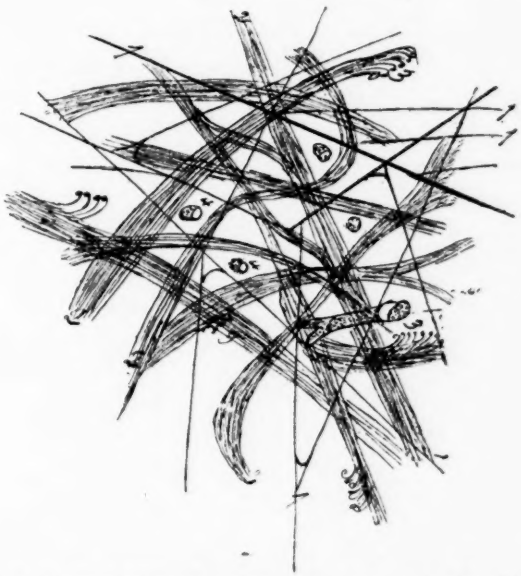

FIG. 7.—Human subserous tissue. 1, 1, A net-work of straight, elastic fibres. Note the triangle at point of anastomosis. 2, 2, Wavy net-work of fibrous tissue; 3, 3, 3, show fibrous tissue curled up at the ends; 4, 4, granular cells; 5, branched cell with perhaps beginning vacuolation. This specimen was teased and mounted in glycerin.

the human is concerned, the subserous tissue adjacent to the bladder and genitals is densely packed with thicker and thinner bundles. The elastic fibres are a distinct, vast element, rivalling the white fibrous tissue in this region. This fact accounts for the capacity of the genital organs to alter their position and return to normal without loss of integrity. The elastic fibres account for the mobile uterus to a large extent. The elastic elements in

mesenterial supports, ligamenta peritonei, is a characteristic feature to allow distention and contraction of viscera and lessen shock in the sudden movements of animals. It also enables the subserous tissue to accommodate itself to the distention and contraction of blood- and lymph-vessels; still more to enable the viscera to adapt themselves to the varying condition of the abdominal walls and moving diaphragms.

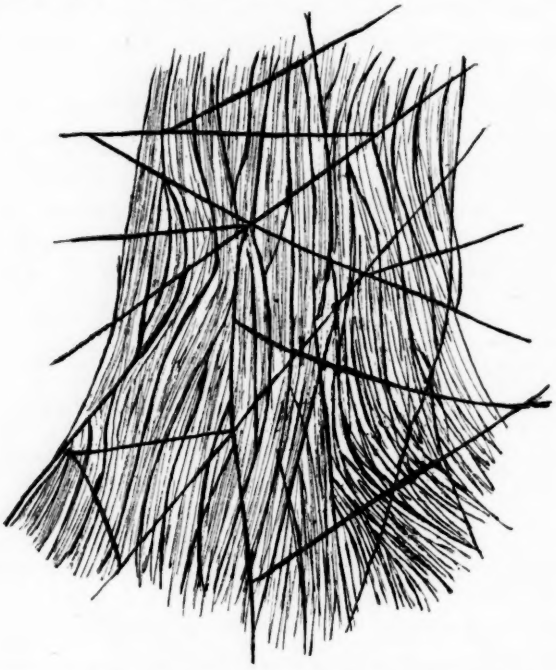

FIG. 8.—Human subserous tissue. It is here attempted to represent a single plane of mesoblastic fibrous and elastic tissue. It is mounted in glycerin, but was not teased. The black net-work is elastic fires.

The elastic fibres (Fig. 8) show their own significance from the anatomic fact that they exist in the subperitoneal tissue, as far as I have made research, in proportion to the mobility of the viscus. Where an organ has a fixity to it, the elastic fibres exist in a minimum. Where an organ has a wide range of mobility, these elastic fibres exist in a maximum. In short, the wonderful contractility and expansibility of the peritoneum is due to elastic

fibres. It adjusts itself to physiologic and pathologic conditions by elastic elements. In examining, microscopically, many serous membranes one can observe a variety of elastic tissue. (*a*) In some fields of the microscope we can note a long, fine fibre of elastic nature which never branches. It may take a large, sweeping curve or a short, spiral-like curve, but it always remains the same unbranched strand; it never splits. In teased preparations it may be irregularly curved or spiral from being loosed from its attachments.

(*b*) Another variety, which is abundant in the carnivora, especially the cat and also the rabbit, is characterized by the anatomical fact of existing in bundles, and it sends branches out at various points. The bundles of elastic fibres may be of considerable thickness. They may send off branches, and these in turn send off more branches. This form of elastic fibres may be so abundant as to out-rival all other forms of tissue, especially in the mesenterium. It may be best observed in its anatomical relations by mounting a piece of mesentery in glycerin. It is not then disturbed by tearing or trauma, and one sees the two endothelial membranes and the membrana mesenterii propria undisturbed. This form of elastic fibre divides or branches so that at the point of division a peculiar triangle is observed. It is distributed irregularly in the subserous tissue.

(*c*) Another form assumes a kind of irregular mesh-work. It consists of quite fine fibres. Professor Hubert Luschka drew such a natural figure of such fibres forty-five years ago that I will recopy it to illustrate the elastic net-work. The forms *b* and *c* may not always be easily distinguished from each other on account of the peculiar way of branching. But the form *c* is distinctly more like a fish-net, while the variety *b* takes wider and more sweeping curves, and its mesh-work is more irregular. (*d*) A fourth form I will only mention, as I have not investigated it. It is the membranous form of elastic fibre, so well described by Henle. It is found especially in large arteries. Of course, I might say that this membranous form of elastic fibre is almost exactly the same as others, except that the large bundles in the form of *b* have simply blended, leaving small or large holes

between the wide bundles. In such a form I have studied it, but not in the large blood-vessels. Finally, it may be said that it is not always easy to distinguish a single isolated elastic fibre from a single isolated white fibre.

The fibrous connective tissue (Fig. 9) together with the elastic fibres constitute the mesenterial supports, ligamentum peritonei, the membrana mesenterii propria,—that is, the white fibrous and elastic tissue is woven into web or membrane, which is the real neuro-vascular visceral support (Fig. 10). In the mesentery this membrana mesenterii propria, consisting of elastic and white

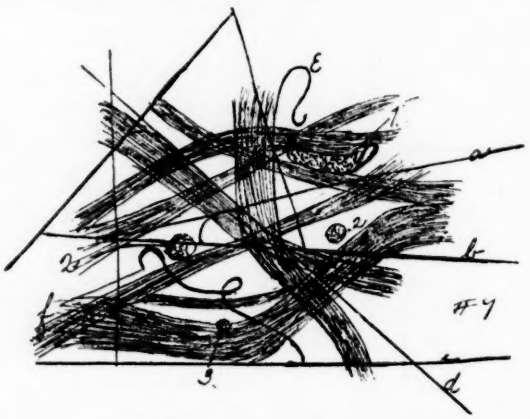

FIG. 9.—Human subserous tissue selected near the psoas muscle. 1, A branched cell; 2, 2, granular cells; *a*, *b*, *c*, and *d*, elastic fibres showing a wide net-work of straight elastic fibres. At *e* and *f* the elastic fibres curled up by being teased,—*i.e.*, broken from their attachments. This tissue was teased, and as soon as elastic fibres are broken they spring into curls or loops. 3, Wandering lymph-corpuscle.

fibrous connective tissue, is faced on both sides by flat endothelia. The mesentery consists, then, of three parts,—viz., (*a*) a layer of flat endothelia on each face and (*b*) a middle layer, the membrana mesenterii propria. The middle membrane of the mesentery supports the arteries, veins, lymphatics, and nerves, and retains them in anatomic and physiologic relations. The membrana mesenterii propria is the chief element in visceral support. In fact, the endothelial membrane facing each side is merely the whitewash of a wall or the veneer of a building, while the iron

framework is the membrana mesenterii propria. The various proportions of white fibrous or elastic fibres which go to make up this membrana mesenterii propria characterize the different mesenteries of animals. The rabbit's ligamentum peritonei is

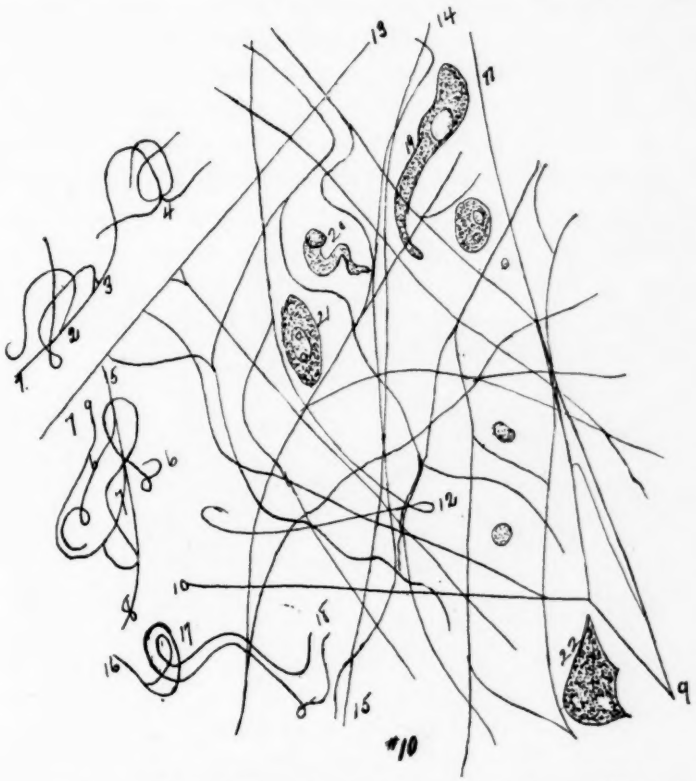

FIG. 10.—Human elastic subserous tissue teased and mounted in glycerin. 1, 2, 3, and 4 show an elastic trunk which branches and curls up at the ends; 5, 6, 7, and 8 show other elastic fibre endings; 9, 10, and 11, straight fibres; 12, curled elastic fibres; 13, an elastic trunk; 14 and 15, straight non-branched elastic fibres; 16, trunk; 17 and 18, branches of elastic fibre; 19, 20, 21, and 22, various kinds of cells lying among the elastic fibres; 22, appears dividing into two cells with two nuclei.

characterized by much elastic fibre, and especially any mesentery which is called on to do much work. And any mesoblastic bed that is adjacent to a mobile organ is particularly noted for its predominant supply of elastic tissue.

Besides the two dominating elements of elastic and white fibres, there are other smaller and more irregular elements found in microscopic examinations. It is plain to note macroscopically that the web woven by the elastic and fibrous strands extends like sheaths all along the vessels to the remotest parts of the body. This mesoblastic web of elastic and fibrous cords ensheathes or fixes the great blood-vessels and nerves and lymphatics, especially of the abdomen. It supports in order to retain in relations the viscera. It is, in fact, the mesoblastic bed, the mesoderm, in which was originally developed the blood-vessels

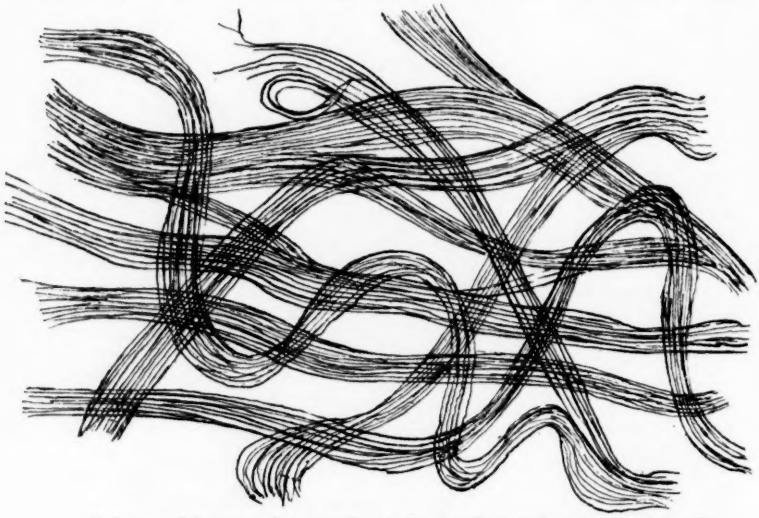

FIG. 11.— Human subserous tissue, drawn after teasing, mounted in glycerin (oc, 2. obj. 8a, Reichert). When the subserous tissue is not teased the fibres of the same plane are nearly all parallel.

and the lymph-vessels. There are two views held as regard the origin of the white and elastic fibres. One view (Beale and Schultz) is that the protoplasm of one kind of embryonic cell is directly converted into fibrils while the protoplasm of another kind is converted into elastic fibres. Another view is that the white fibrils are deposited in the ground substance, while the elastic fibres (according to Ranvier) are from the fusion of granules or globules. These fusions result in the fine elastic fibres and elastic membranes. But still the small elements of subserous tissue demand attention. (Fig. 11.)

First we may consider the granular cell. This cell consists generally of a round body which has a number of distinct granules in it. The nucleus is round or oval. The cells are numerous near blood-vessels, and are especially abundant in the subserous tissue of the broad ligament, which is quite vascular. I noticed that such often has its nucleus situated towards one side, eccentrically, while the granules collect especially towards the one side. The granule cell is very variable in shape and size and even in the distinctness of its granules. But, in general, the granule cell I found abundant in the subserous tissue of man, rabbit, and frog. Such cells are said to stain well with eosin and some aniline dyes. However, the cell is plainly recognized by mounting freshly-teased preparations of subserous tissue.

The fixed connective-tissue corpuscle must be well studied in subserous tissue by a high power. The connective-tissue cell consists of a body and a nucleus towards its centre. The body may appear flat, stellate, or with branched processes. The connective-tissue corpuscle suffers many changes on account of the participation in the intercellular tissue. In primitive condition, as in Wharton's jelly or the umbilical cord, the connective-tissue cell has a formidable size. But with growth-changes the body assumes a smaller outline, and the protoplasmic processes contract to fine thread-like fibres, and finally the small nucleus is contained in a thin-walled body. As far as I can see, the granular- and connective-tissue cells may be occasionally confused with each other. Both cells vary considerably in size.

In the subserous tissue there is a peculiar cell known as plasma or vacuolated cell. These cells were especially described by Waldeyer. They may be found fairly constant and frequently in teased preparations. These cells are of an indefinite form, round, spindle-shaped, and some possess projecting processes. (Fig. 12.) There are vacuolations in the cell which distinguishes them from other cells. Again, a part of the cell may be vacuolated while the other portion may be quite granular. I have noted that the nucleus is quite large sometimes and of an elongated oval.

The flat, lamellar, or branched cell found in the subserous

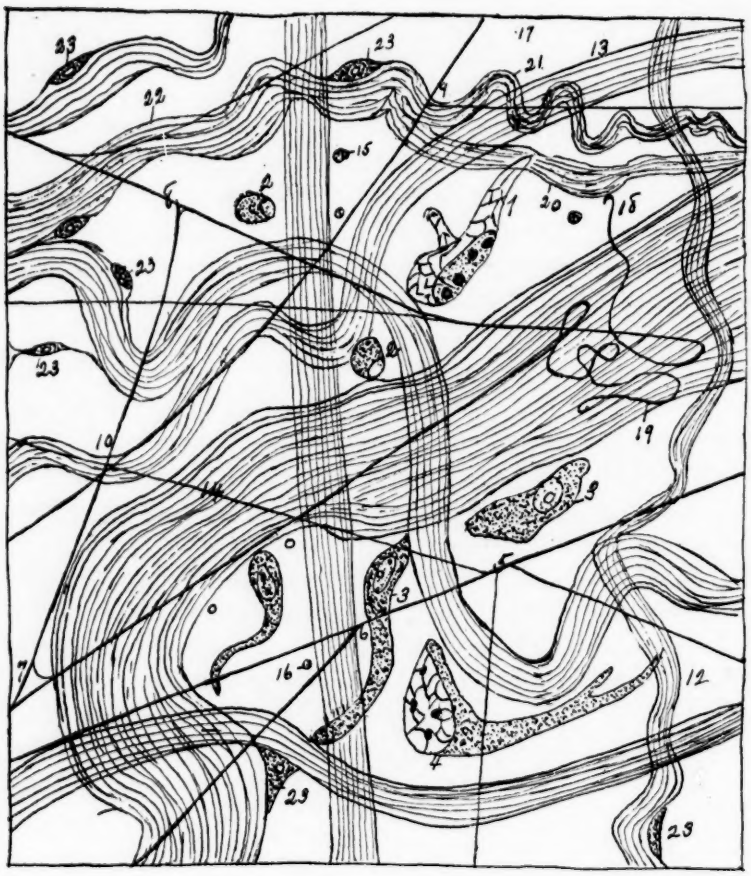

FIG. 12.—Human broad ligament from a woman of fifty. The tissue was carefully cut from the cadaver, dead thirty hours, and placed in water. The subserous tissue is macroscopically divisible into exceedingly thin mesoblastic planes, and these planes, almost invisible, float in the waving water. This specimen is cut from one of these very thin planes, and mounted in glycerin without being teased, hence the bundles of fibrous tissue are about parallel, of course, but an infinitesimal portion of the fibres are drawn. 1, vacuolated cell with oval nucleus and nucleoli; 2, 2, granular cells most abundant near blood-vessels; 3, 3, flat or branched cell; 4, partially vacuolated cell. The flat, branched, or vacuolated cells are quite irregular elements. 5, 6, 7, 8, 9, and 10, represent a wide mesh-work of elastic fibres; 11, 12, 13, and 14, bundles of white fibrous tissue (non-teased); 15, 16, and 17, granular, wandering, or lymph-cells; 18 and 19 show the curly endings of elastic fibres; 22 splits up into the straight bundle, 20, and the wavy one 21; 23, 23, 23, 23, connective-tissue corpuscle.

tissue belongs to the connective-tissue cell. These are the various forms with varied processes projecting from either end. The nucleus is large, round, or oval with a nucleolus. Again, in contact with the larger connective-tissue elements may be seen large numbers of small, round, or ovoid masses. These are lymph-corpuscles, and, on account of their capacity to change their locality, are called wandering cells. These wandering cells appear of various sizes. The difference in size may be owing to the plane of vision or to their more or less flattened shape. In

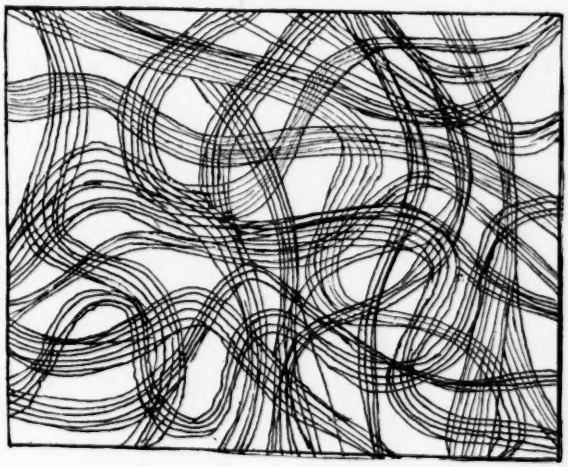

FIG. 13.—Dog's mesentery in a mild solution of formalin, only the white fibrous tissues are drawn. Some are very much waved. Notice that the fibres all cross the whole length of the field. The fibres are so rich in number that no kind of drawings gives an adequate view. In this specimen no elastic fibre is represented. However, the elastic fibre is quite scarce here.

some specimens of subserous tissue, well teased, I have noted much larger numbers of wandering cells than others. Why one specimen of subserous tissue is characterized by more wandering cells than another is not clear.

The fibro-elastic strands underlying the peritoneum are the binding, supporting, and accommodating element. They exist in quantity according to the necessities of the viscera,—fixed viscera demands a small amount, while movable organs require a large amount, especially of the elastic. (Fig. 13.)

The practical application of the fine structure of the subperitoneal tissue to medicine and surgery is important. The chief subperitoneal tissue belongs to the dorsal wall, and in this region will play the chief *rôle* of disease. The subperitoneal tissue supports viscera in their bed. It is liable to inflammation, primarily, but especially as a secondary process,—an extension from diseased viscera. The chief *rôle* which the subperitoneal tissue plays is its relation to pus. We noted that the tissue was composed of exceedingly fine laminæ, of thin plates of mesoblastic

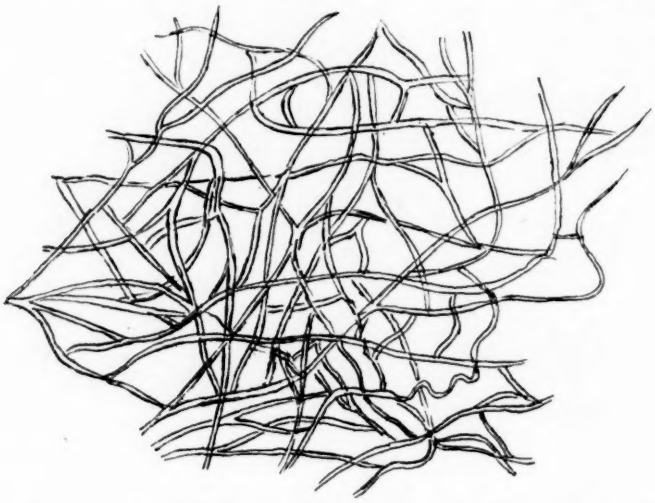

FIG. 14.—After Luschka, 1851. It illustrates how elastic fibres will form a mesh-work resembling a net. It also shows how the superficial and deep layers of the elastic planes will blend and anastomose with one another. The drawing is taken from synovial membrane.

planes. Any fluid can find its way slowly between these thin planes of tissue. No doubt the reason that pus penetrates so universally in all directions in the subperitoneal tissue is because it is composed of fibro-elastic planes which are separable by slowly-pressing fluids. One can macroscopically divide and tear this fine tissue into numerous fine, transparent sheets. The pus will press these planes apart in the direction of least resistance. (Fig. 14.) The pus derived from diseased pelvic organs takes many directions because it has no definite barrier. The pus of

appendicitis, when it arrives in the subperitoneal tissue, splits the planes of mesoblastic tissue towards the liver, because the subperitoneal tissue along the psoas muscle is abundant, and where it is abundant its planes are more easily separated. In fact, I have found in most bodies that the mesoblastic planes of subserous tissue are always the most easy of cleavage. Besides the planes of easy cleavage in mesoblastic tissue directing pus and fluids between its laminæ there is another application in regard to it. It is known that when fat accumulates in this subserous tissue that its droplets gradually collect within the capsule of a connective-tissue corpuscle or cell. The fat droplets slowly coalesce and grow, expanding the connective-tissue cell or capsule enormously. The fat globule expands until the little nucleus of the connective cell is scarcely visible in its thin wall. This fatty tissue accumulates or aggregates in the genito-urinary region, and especially in the omentum majus,—*i.e.*, in reticulated fibrous tissue until it assumes vast bulks. Now, this fatty tissue or oil globules often suddenly disappear. Now the bulk of areolar tissue,—*i.e.*, connective tissue with corpuscles expanded with oil, has been expanded so long that either its elasticity does not resume its normal function or it is not able to readjust itself so rapidly. The contracting connective-tissue capsules cannot force the adjacent viscera to return and resume the old relations as before. In such cases the kidney wabbles about and with time becomes more or less movable. Its bed is too large. The same occurs with the uterus, which simply glides out of the enlarged vaginal outlet, especially will the uterus glide out of the vaginal outlet if it has become retroverted and intra-abdominal pressure strikes it on its anterior surface. (Fig. 15.) In sacculation and absorption of fat, oil globules, doubtless the number of connective-tissue corpuscles which stored the fat globules remain the same, though on sudden absorption the fat globule, the connective-tissue corpuscle, has lost its function. It has forgotten to resume its old business. It cannot return to the normal for it has lost its integrity. Perhaps the sudden absorption of fat shocked the periphery of the nerve supplying the connective tissue corpuscle for a season. However, we may note

the two important applications of subperitoneal tissue,—viz., (*a*) it consists of fine planes which permit of cleavage by slowly pressing fluids; (*b*) by sudden absorption of fat it becomes impaired in function.

The subject of nerves, blood-vessels, and lymphatic vessels, in relation to the subperitoneal tissue, must be reserved for other times.

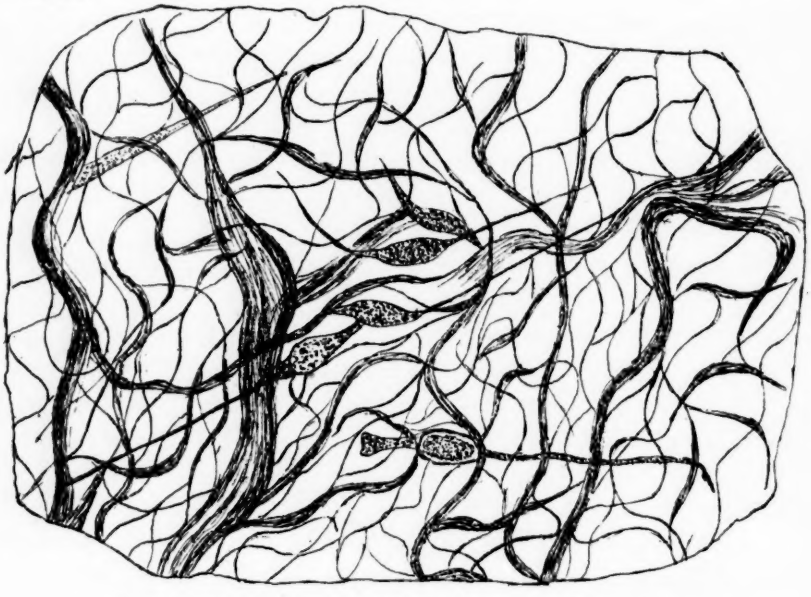

FIG. 15.—After Rollett in Stricker's Hand-Book, 1871. It represents the connective-tissue fibrils of a five-months-old embryo. It also shows the elongated fusiform cells.

To sum up, we note that subserous tissue consists of (1) in quantity, white fibrous connective tissue; (2) elastic fibres; (3) connective-tissue corpuscles; (4) wandering cells; (5) flat, lamellar, or branching cells; (6) granular cells; (7) vacuolated or plasma cells. That its planes of cleavage allow fluids to press in universal directions, and that rapid absorption of fat from subserous tissue elongates and impairs visceral supports.

CASE OF GASTROTOMY FOR FOREIGN BODY IMPACTED IN ŒSOPHAGUS.

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H. S., aged twenty-seven years, was admitted into the Bristol General Hospital on December 21, 1895, with the history that one year and nine months before, he woke up one morning, and, finding his plate in his throat, gulped it down. It was vulcanite, carried two central upper incisor teeth, and covered a large area of the palate. To one corner was attached a metal hook. He gave us the dimensions as one by one and three-quarters inches, and, as will be seen later, these were very accurate. Directly he swallowed it pain set in at the ensiform cartilage. This pain was not increased by the first meal he took (which consisted of eggs and bread), but with this exception, every meal he took increased the pain at the time, but after it was over he was easier than he had been with an empty stomach. This fixed pain at the ensiform cartilage persisted. He was never free from it for more than ten minutes at a time. It was increased by movement as well as by swallowing, and when very severe passed through to the back or up the sternum. He described it as of a boring character. In addition to the pain at the ensiform cartilage, for the first three months after the plate had been swallowed, he also suffered from pain at a spot three inches below the ensiform cartilage in the middle line. Difficulty in swallowing began four months after the accident, and he has had to chew up his food into a pulp before he could swallow it. If he did not it "stuck," and everything he tried to swallow afterwards came back after he had taken a few mouthfuls. Sometimes it took him several hours to swallow an ordinary meal. In swallowing fluids he had to take a sip at a time, until he found the way was fairly clear, or the fluid returned. He had lost sixteen pounds in weight since the accident. Four months

after, he went to a large provincial hospital and was told he must wait, and the plate would pass in time; and a medical man he consulted in Wales assured him that he must have passed the plate without knowing it; that it was impossible it could still be in his stomach. The fixed pain at the ensiform cartilage, which I knew had been present in Mr. Jacobson's case (presently to be referred to), and the symptoms of œsophageal stricture convinced me that the plate was impacted in the lower end of the œsophagus. I thought it best not to pass a bougie for fear of causing perforation of a possible ulcer in the œsophageal wall in close proximity to the aorta. Nothing could be felt in the region of the stomach. The man's life was a misery to him, and he was anxious to have an attempt made, even at considerable risk, to find and remove the plate. As I felt sure that it must be quite low down in the œsophagus,—I thought probably just above its passage through the diaphragm,—and that as it had been so long impacted it might be necessary to use the finger or fingers for its extraction, I determined to try and remove it by passing my hand into the stomach if forceps failed, as had been successfully done by Professor Richardson, of the Massachusetts General Hospital, in a case where the plate had been impacted for eleven months. Although by œsophagotomy a foreign body in the lower end of the œsophagus might possibly be removed by forceps, the finger could not be employed, and the operation showed that in this case nothing but the finger could have extracted the plate.

Before the operation, the administration of food was so arranged that the stomach should not contain any at the time of the operation, though it could not be washed out. It was performed on December 30, under ether. All the usual antiseptic measures for the purification of the skin of the abdomen having been taken, I made an incision two inches in length, from just below the ensiform cartilage downwards nearly parallel with the left costal margin, but diverging slightly from it below. On opening the abdominal cavity the left lobe of the liver was exposed, and on drawing it up, the empty stomach was readily found. I could easily feel the outside of the œsophagus at its junction with the stomach, but failed to detect any foreign body. I then enlarged the incision in the abdominal wall another inch downward, and brought the anterior wall of the stomach well out through the wound, and passed a silk ligature through the wall in the direction of my intended incision (as is done through the bladder wall in suprapubic cystotomy by some surgeons) in order to

retain a firm hold on it. All round the extruded stomach wall I packed the abdominal cavity with sponges, to which long threads of silk were attached, so that they might not slip out of the field of operation and become lost in the abdomen, and later on in the operation I packed in iodoform gauze also. After making an incision just large enough, I introduced my finger and at once detected the œsophageal opening, and above it a stricture so tight I could not pass my finger into it. A long probe, however, passed through and struck a hard foreign body; œsophageal forceps would not pass. I spent some time trying to dilate it with bougies, and I think I did so to a certain extent. Then on passing a bougie by the mouth (a proceeding I was unwilling to adopt except as a last resort for reasons already given) it pressed down the stricture within easier reach of my finger, and I managed to force the tip of my finger through and felt the plate. By this time a condition of extreme collapse had come on, but by hypodermic injections of ether and strychnine and enemata of

Tooth plate showing (*a*) end of the broken or eroded metal hook.

brandy we were able to improve his condition somewhat, and I feel that I am greatly indebted to Mr. Freeman, our anæsthetist, for the care with which he endeavored to sustain his failing strength while I strove to get away his plate in the face of such great difficulties. I partly dislodged the plate (see Fig.) by digging it out with the tip of my finger, so that it began to present through the dilated stricture. But then it stuck for a long time, and it seemed as if there it must remain. Every conceivable form of forceps was tried, and even a lithotrite. Œsophageal forceps were the only ones which grasped it, but they would not hold, as the vulcanite edge presenting was too smooth. At last by means of my finger-tip and a long lithotomy scoop I literally dug it out, to the considerable detriment of my finger. The scoop was a very great aid. During the first introduction of my hand into the stomach some watery fluid escaped (gastric juice and mucus), some of this was caught by my assistant on the sponge he held in his

hand and some ran into the uppermost sponge in the abdomen. During the extraction of the plate, a constant slow oozing of blood was going on and escaping from the stomach opening into this upper sponge. The upper end of the stomach incision was close to the œsophageal opening and consequently dependent, and within the abdomen, and hence all fluid escaping from the stomach ran into the sponge placed between it and the left lobe of the liver and into some iodoform gauze which I introduced to catch it. When I removed the sponge at the end of the operation I found it soaked. I closed the incision in the stomach with three layers of silk sutures, a continuous one for the mucous membrane, one just bringing the muscular wall together at rather distant intervals, and another at quite short intervals, taking in the peritoneum and a little of the muscle about one-quarter to one-half an inch from the margin of the incision, and burying the other junction by inverting the wall over it. This was done because the actual edge of the incision had been nipped in several places by the catch forceps which it had been necessary to use in order to control bleeding from the numerous vessels divided in making the incision. The portion of the stomach which had been sutured was then sponged over with 1 : 40 carbolic solution and returned, and the incision in the abdominal wall rapidly sutured with silkworm gut. After the removal of the sponges, the liver again fell over the stomach and shut it off from the skin incision. His condition of collapse had lessened by the end of the operation, and the pulse was only 120, though he was very pale. While the dressing was being applied he vomited a little mucus and blood.

As soon as consciousness returned he complained of pain at the same old spot. It came on in paroxysms, but did not last for as long as a minute. He was fed by nutrient enemata, containing brandy, and nothing was given by the mouth. On the following day the pulse was 140 and he seemed very prostrate, and hypodermic strychnine injections were given with morphine, but on the second day after the operation it had fallen to 120. The nutrient enemata were all retained until the third day after operation, when they had to be changed to nutrient suppositories, which were retained. By this time the wound seemed firmly united, and there was no distention of the abdomen and no tenderness in the lower part. Pulse was 100 and his strength seemed increasing. The paroxysms of pain, however, continued, but only lasted a few seconds. Very minute pieces of ice were given him now and then. During the night of the third day he

was very restless and had pain in the upper part of the abdomen like "bellyache." Next morning this was much easier, but on removing the dressing it was found soaked with a rather unpleasant-smelling, thick pus which had oozed out between the stitches of the wound. The lower abdomen was, for the first time, rather distended and a little tender, but the wall was not rigid. I had much anxiety as to whether the stomach wound had given way and set up general peritonitis, but the pain was so distinctly relieved by the discharge of pus, which must have existed as a collection before discharge, that I contented myself with removing the sutures from the wound (which then gaped open) and passing in my finger so that I could feel if the part was shut off from the general cavity or not. It seemed to be shut off and the pus appeared to come up over the left border of the liver between it and the chest wall; so that I passed in that direction a wick-drain, such as Morris, of New York, has recently advocated in his work on appendicitis. It consists of a roll of gauze, about the size of a lead-pencil, wrapped up in "protective," just as tobacco is wrapped up in paper to form a cigarette. By closing the end protruding from the abdomen in a mass of loose gauze, it forms a good capillary drain and does not become adherent to the surrounding parts, or blocked by exuded lymph. His pulse had risen to 120 again, but there had been no rise of temperature. On the following day (fifth after operation) he was almost free from pain and the distention of the lower abdomen had quite subsided. There was not much pus drained through the wick-drain or discharged by its side. He seemed getting very emaciated, only the nutrient suppositories and a little brandy could be retained by the rectum. Half a drachm of peptonized milk and half of brandy were given every quarter of an hour by the mouth, and this was increased to nearly an ounce of both together every quarter of an hour on the following day. There was no vomiting. The prostration increased and he died on the eighth day.

Post Mortem.—On raising the left lobe of the liver, which was adherent at its lower edge to the abdominal wall, a few drachms of pus and numerous patches of lymph were found on the anterior surface of the stomach and over the pylorus and splenic end, and some little pockets of pus were found between the stomach and the liver and spleen, but there were no signs of peritonitis over the transverse colon or below it. At first the wound on the anterior surface of the stomach was not discovered,—only a row of small ulcers were seen, just below the cardiac orifice, but on careful inspection the remains

of the fine silk sutures were discovered in them. The lower part of the incision was covered by adherent omentum. The left lobe of the liver lay over this part of the stomach, but was not adherent to it, a space existing between the two which communicated with the surface wound by a track passing over the left border of the liver and along which the wick-drain had been passed. The stomach was somewhat distended with gas. On dragging on the organ the wound opened at one spot and then the stomach collapsed. On further examination of the stomach it was found that the union of the wound broke down on the gentlest manipulation, indeed, beneath the adherent omentum it was already gaping. The incision was found to reach from two inches below the cardiac orifice, downward, as far as the greater curvature. There was no peritonitis on the outside of the œsophageal opening. In the lower end of the œsophagus, an inch above the diaphragm, was a thick, oval-shaped pouch measuring one and a half inches in breadth and three inches in length. The œsophagus above the pouch was normal, but at their junction was a stricture so tight that only a No. 10 catheter would pass; at the lower end of the pouch was a firm rim where the previously existing stricture had been dilated (not torn) during the operation. The wall of the pouch in some parts was half an inch thick and seemed to be composed of white fibrous tissue. The mucous membrane in the interior (where the plate had been lying) was extensively torn and ulcerating over a wide area just above the lower stricture, but the laceration was confined to the mucous membrane. There was only one small tear in the mucous membrane of the œsophagus below the stricture, and no damage had been done to the mucous membrane of the stomach. There were no adhesions of the pouch to the aorta or any other structure with which it lay in contact, and no inflammation of either pleura or pericardium.

To what was the localized peritonitis due? It seems to me probable that it was due to the prolonged contact of the soaked sponge (which I have already referred to) with the peritoneum. There was no leakage from the stomach wound, though it was rapidly breaking down, as the abdominal incision had done, from the presence of the pus on its surface. Moreover, a collection of pus was discharged on the night of the third day after the operation, and which must have been forming for a day

or two before that,—almost from the time of the operation. After removal of the sponges at the end of the operation, I carefully inspected the peritoneum and did not detect any trace of blood, but I cannot help thinking that the prolonged contact of the soaked sponge must have set up the peritonitis.

There was nothing in the condition of the lower end of the œsophagus to have brought about a fatal result. The damage done in removal of the plate was not extensive, and would probably not have led to any disastrous results. The stricture above the pouch could have been easily dilated with bougies. It is interesting that with stricture of eighteen months' duration there was no pouching above the upper stricture. The case demonstrates the possibilty of removing such a plate after nearly two years' impaction, and after stricture has formed, without such injury to the parts as would be likely to prove serious; but it shows the enormous difficulty which may be encountered in such removal, the great shock which such an operation will produce, and the risk of peritonitis from escape of stomach contents even when the peritoneal cavity around is well packed with sponges and iodoform gauze.

Richardson's[1] patient was a man aged thirty-seven years, who came up to the Massachusetts Hospital the day after swallowing a plate with four teeth attached to it. It seemed fixed at the cardiac orifice of the stomach. Numerous unsuccessful attempts were made to remove it, and at last it was thought that it must have passed into the stomach, and he was discharged; but eleven months later he again applied for relief and the plate was found at the old spot. An attempt was made to extract it with forceps passed through an incision in the wall of the stomach, but the cardiac opening could not be found. The whole hand was then introduced. The plate was found about two inches above the diaphragm, and was removed by manipulation with the index and middle fingers. The patient recovered. There does not appear to have been anything like the difficulty in removal encountered in my case. Richardson considers that

[1] Transactions of the Ninth International Medical Congress, Vol. I, p. 629; and Lancet, 1887, Vol. II, p. 707.

the best way to find the cardiac orifice by forceps introduced into the stomach is to put the lesser curvature on the stretch by dragging on the organ, and then guiding the instrument along the lesser curvature into the cardiac opening. I have tried this on the dead body and found it by no means easy to get the lesser curvature well on the stretch by manipulation carried out through such an incision as I made in the operation I carried out for removal of the plate. But if by the introduction of the hand into the stomach in the dead body we become familiar with the exact position of the cardiac opening, I am sure there will be no difficulty in at once passing instruments through it, as I found in the case I now record. I must say it does not lie quite where I expected to find it when I introduced my hand into the stomach on the dead body, but when once we have located it to touch from within the stomach there seems to be no difficulty in finding it with instruments when operating. Mr. Jacobson's case[1] was that of a man, aged forty-seven years, who swallowed a vulcanite plate which had originally carried seven teeth, but when he swallowed it only two. It was pushed down the œsophagus by a medical man who saw him directly after the accident. There was constant pain—just where my patient experienced it also—immediately below the ensiform cartilage, but no difficulty in swallowing. A bougie passed into the stomach, and rubbed over a foreign body just before it entered, but with as much force as Mr. Jacobson thought right to use, the plate could not be pushed on into the stomach. Mr. Jacobson does not tell us how long the plate had been impacted in the œsophagus. He performed an operation similar to Professor Richardson's and my own, but neither he nor two of his colleagues, who also introduced their hands into the stomach, could extract the plate. The patient did not recover from the shock of the operation.

[1] The Operations of Surgery, 2d edition, p. 822.

GUNSHOT WOUND OF THE INTESTINES, WITH SIXTEEN PERFORATIONS; ENTERORRHAPHY; USE OF THE MURPHY BUTTON; RECOVERY.[1]

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THE following case is of special interest on account of the successful result of the closure of sixteen perforations of the intestine, and on account of the two factors which contributed very largely to this result,—*i.e.*, the very liberal use of hot, sterile, normal salt solution for cleansing, and the fact that the patient had eaten nothing for twenty-four hours previous to being shot.

The patient, W. McC., age twenty-three, was brought in the ambulance to Bellevue Hospital at 10.30 P.M., on December 21, 1895, immediately after being shot twice by a pistol of thirty-two or thirty-eight calibre, in the hands of a man who stood nearly in front of him or a little to his left side. Between this time and 3 A.M. of December 22, when I was called to see him, he had vomited a number of times, not only when stimulants were given by the mouth, but at frequent intervals between. He had had one movement of the bowels, composed mostly of blood. At 11 P.M. his temperature was 99.6° F., pulse 94, respiration 28. There was considerable shock, from which he rallied in part after stimulation by hypodermic injections.

When I saw him, about 3 A.M., December 22, he complained of great abdominal pain and was vomiting occasionally. He had partly

[1] Case presented to the New York Surgical Society, January 22, 1896.

rallied from shock, but his pulse was more rapid and the temperature was higher than when taken four hours before. He presented the appearance of beginning peritonitis. There was one bullet-wound of the left buttock, the bullet having emerged at the inner side of the buttock, and another wound about midway between the anterior superior iliac spine and the umbilicus. A probe introduced into the latter wound passed dorsally inward and downward, but only as far as the muscular abdominal wall. There was no tympanites. His urine was normal.

An operation was immediately begun under ether anæsthesia, with the assistance of the house staff. A vertical incision was made a little to the median side of the abdominal bullet-wound and nearly over the left semilunar line. This incision met the track of the bullet as it penetrated the sheath of the rectus muscle near the outer border of the muscle. A blunt probe introduced indicated the course of the bullet to have been more transverse than was at first supposed, so that this incision was carried no farther. A median incision was therefore made from the symphysis pubis to the umbilicus, in order to reach both sides of the abdomen equally well. A moderate quantity of blood, mixed with serum and blood-clots, was found in the peritoneal cavity, and the peritoneum was highly congested. Only a small amount of recognizable fæcal matter was found. The small intestine was examined from the ileo-colic valve to the duodeno-jejunal junction, and sixteen perforations were found in the small intestine and one in the mesentery. Most of these were in the lower ileum, but several were some distance above in the jejunum. The intestines were remarkably empty and collapsed. The perforations were marked as found by artery clamps, and one after another were closed with continuous Lembert sutures of fine silk, applied transversely to avoid stenosing the gut. At one point in the lower ileum four perforations were found in the space of about two inches, where the bullet had apparently traversed a knuckle of intestine. As these could not be closed without causing marked stenosis and kincking of the gut, about three inches of the latter was excised and the ends approximated by a Murphy button, saving thereby considerable time. Large quantities of hot, sterile, normal salt solution were used to clean the surface of the intestines and mesentery and to wash out the cavity, and the intestines were protected throughout with sterilized gauze repeatedly wet in the same solution. The bladder, sigmoid flexure, and cæcum were examined and found intact, and as the

bullet and its track was not easily found it was not sought for. The wound was closed in the usual way, leaving a glass drainage-tube near its lower end. Through this tube a salt solution was injected and again sucked out until it came away nearly clear.

The operation was naturally a long one, lasting over two hours, but at its close the condition of the patient was fairly good. The drainage-tube was exhausted, by means of a sterilized rubber catheter and a syringe, every half-hour for the first few hours, after which no fluid came away.

At 9 A.M. on the following day his temperature was 101.6° F., pulse 140, and respiration 56, and at noon of the same day the temperature reached its highest point, 102° F., after which it continued to fall to 100.2° F. at 3 A.M. on the next morning, the pulse and respiration improving correspondingly. On the day after operation he retained the small amounts of milk and lime-water given, and again some of that given on the following day; but as he vomited more or less from time to time, feeding by the mouth was discontinued, and he was nourished mostly by rectal nutrient enemata for twenty-four hours, after clearing the rectum by a small injection. After giving the stomach a nearly complete rest for twenty-four hours it retained nourishment from the fourth day on, with only occasional vomiting. He was kept on a fluid and soft diet for about two weeks. His bowels moved first on the third day, after an injection which relieved an attack of abdominal pain. After this the bowels were moved every day, or every other day. Vomiting and pain and a rise in temperature on the sixth day were relieved by washing out the stomach and by the movement of the bowels following a large enema. The Murphy button was passed on the ninth day. The tube was removed after four days and the sutures after nine days. The wounds healed *per primum*, except for small granulating depressed surfaces at the site of the tube and the entrance of the bullet-wound, the edges of which had been much blackened by the nearness of the revolver. Stimulation was discontinued after the third day.

The course of the case was comparatively uneventful after the operation, and this I attribute, apart from the fact that the exposed surfaces and the general peritoneal cavity were thoroughly and repeatedly cleansed with quantities of hot, sterile, normal salt solution, to the fact that the bowels were remarkably empty, owing to the fact that he had eaten nothing for over twenty-four

hours prior to the accident. This is a most important point, especially in cases where there are many and large perforations, as in this case. Attention has already been called to this point by Matas, of New Orleans, in connection with a case where the number of perforations was even larger,—over twenty.

Although this patient did so well, I was not very sanguine as to the result for a number of days, on account of my experience in a case four years ago, in which I sutured eleven perforations. This case did perfectly well until the third day, when he rapidly sank, and died without any peritonitis or other apparent cause, as shown by the autopsy. Death in this case was probably due to auto-septicæmia. Usually, owing to partial intestinal paresis, due to the injury or to beginning peritonitis, or from the fear of actively moving the bowels at once, there is constipation for some days, and the intestinal contents have abundant opportunity, by putrefaction or over-digestion, to form ptomaines or leucomaines to be absorbed by the inverted edges of the intestinal wounds. Hence the importance of an empty bowel. The experience in the present case goes to confirm this view, as here there were practically no intestinal contents from which absorption could occur.

Thinking that we might to some degree prevent auto-septicæmia by the employment of some intestinal antiseptic, like salol, betanaphthol-bismuth, or naphthalin, this patient was on the second day put on the regular use of salol, which was discontinued after a week. Whether this had any effect in this case, or would have had if the bowels had been full instead of empty, I am unable to say.

NOTE ON THE TREATMENT OF DIFFUSE OSTEOMYELITIS OF THE FEMUR BY TOTAL DEMEDULLIZATION.

By W. J. MILLER, M.D.,

OF ST. LOUIS.

MAMIE R., aged sixteen years, had grown rapidly, and was tall for her age. Excepting occasional attacks of tonsillitis, for the previous five or six years, her health was very good, until January 5, 1894, when, in climbing through a window, she struck her knee against a trunk. Very little pain was felt at the time from this bruise, but five days later pain suddenly commenced in this knee. The pain was very severe, and extended up to the hip. By the following day the thigh had become immensely swollen and painful to touch, with general fever, which continued from that time on.

Treatment of various kinds was carried on during the succeeding four months, including multiple incisions, until May 14, when she came under the care of Professor Bernays. She was now very anæmic and weak; no albuminuria. On examination of thigh were found five sinuses and fistulous tracts, all discharging and leading into the femur. Two were situated internally, one at middle third, one at lower fourth; two externally, one at junction of lower and middle thirds; one anterior, above inner condyle, leading into the bone.

Bacteriological examination showing *staphylococcus pyogenes aureus*. The clinical history and result of examination justified the diagnosis of acute infectious osteomyelitis of the right thigh.

The absence of a previous acute infectious disease, for instance, typhoid fever or scarlet fever, also the absence of any tubercular or syphilitic antecedents, permitted the exclusion of any specific form of osteomyelitis, whilst the acuteness and locality of the infection, the quick growth of patient, gave affirmative proofs in favor of the acute infectious form of osteomyelitis.

From an etiological stand-point, it is highly interesting to keep

in mind that the trauma producing the onset of the acute infectious osteomyelitis was preceded by frequent attacks of tonsillitis.

It is a well-known fact, established by all those that have experimented upon acute infectious osteomyelitis, that in order to produce it two factors must be present,—viz., infection and diminished power of resistance of the affected locality.

This, applied to the case in question, would necessitate the consideration of the various attacks of acute tonsillitis as the probable source of the infection, whilst the trauma of the knee-joint, that had preceded the acute inception, must be held accountable for the diminished resistance in this case.

That tonsillitis may lead to systemic infection is demonstrated beyond a doubt. We know now that most, if not all, cases of inflammatory rheumatism are preceded by tonsillitis, and also acute infectious osteomyelitis can be traced back to the same mode of infection.

Inflammatory rheumatism, as well as acute infectious osteomyelitis, is to be considered as localized pyæmic infection.

The patient was sent to the Rebekah Hospital, where, on May 16, Professor Bernays made an incision extending from trochanter-major to two inches below popliteal space (see Fig.) down to the periosteum, which was elevated, and the soft parts well retracted. The femur was then opened with the chisel for about one-fourth of its circumference on the line of incision, from the external condyle to the epiphyseal line of the trochanter major. The entire medulla presented a broken down yellowish mass of *débris* and pus, and in some places the marrow was of a reddish color. With the strong bone curette the entire medulla and cancellated bone-tissue was removed, leaving only a shell of the diaphysis of the femur, in the shape of a long gutter, ending in the completely excavated condyles. The finger could explore the cavity of the condyles with ease after the excavation of the diseased, spongy, and cheesy mass. The fistulous tracts were dissected out, and packed with gauze, making a clean and thorough operation. The bone cavity was packed with iodoform gauze.

About one-third of the incision above was closed with interrupted silk sutures embracing the skin and musculature down to the periosteum; the lower third of the incision was closed in like manner. The dressing applied, and limb put on posterior splint.

The first dressing was changed on the sixth day; the wound

was found healthy and beginning to granulate. The parts of the incision closed by sutures had healed primarily, with the exception of a slight separation of the skin in one or two places.

Final result of operation for relief of osteomyelitis of femur.

The dressing after this was changed every second or third day.

The highest temperature (on sixth day) reached 101° F.; after this it remained normal.

Her condition improved rapidly. Recovery progressed uneventfully, and the patient left the hospital in seven months, with the wound entirely healed.

The figure, taken in January, 1896, shows the end result of the case. The position of the limb is that of a genu-valgum. She dances and attends to her work without any trouble or pain, having a good and useful limb, with nearly perfect flexion and extension at the knee-joint.

From the history and clinical observation of this case I may be permitted to draw the following conclusions:

(1) Tonsillitis precedes acute infectious osteomyelitis, and it is probable that the germ enters the system from this source.

(2) In this case the staphylococcus pyogenes aureus was the etiological factor.

(3) Total demedullization of the whole diaphysis and lower epiphysis of the femur is an operation which can be successfully performed, with the result of saving a limb and getting a useful knee-joint.

CASE OF A FIBRO-ANGIOMA SITUATED BENEATH THE FOUR-HEADED EXTENSOR OF THE LEG; WITH SOME ACCOUNT OF SIMILAR MUSCULAR TUMORS.[1]

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OF PHILADELPHIA,

PROFESSOR OF SURGERY IN THE PHILADELPHIA POLYCLINIC AND WOMAN'S MEDICAL COLLEGE OF PENNSYLVANIA.

THE unusual character and situation of the growth herein described have led me to report the case to the Academy.

A girl, aged seventeen years, was admitted to the Woman's Hospital on January 8, 1895. Her general condition was good, but for about two years she had noticed a swelling just above the right patella on the anterior surface of the thigh. This swelling had been increasing since it was first noticed, and had given pain, which she thought was more marked in damp weather. An examination of the chest and urine showed nothing abnormal. The patient has no recollection of there having been any injury, though it is said that, about two years before the swelling at the right knee was noticed, she had had boils on the right leg.

Just above the patella on each side of the front of the thigh was a smooth swelling, without discoloration of the skin, that gave to my fingers the impression of fluctuation. I felt quite sure that the condition was one of chronic inflammation, with serous distention of the bursa situated between the tendon of the four-headed extensor and the upper portion of the synovial sac of the knee-joint. It seemed to me that I could get fluctuation from side to side beneath the tendon, which depressed the distended bursa in the middle line. I therefore introduced an aspirating needle into the tissues, but no

[1] Read before the Philadelphia Academy of Surgery, November 4, 1895.

fluid was obtained. My belief in the presence of fluid was so strong that I then thrust a trocar deeply into the swelling. No fluid escaped. At this I was much astonished.

An incision three inches long was then made on the outer side of the thigh through the lower portion of the external vastus muscle. The introduction of the finger showed that a soft and spongy tumor existed, and that it passed underneath the tendon of the four-headed extensor. My attempts at removing the growth were unsuccessful until I had made a similar incision on the opposite side of the limb. Having dissected the growth loose from the surrounding structures on both sides, I was finally enabled to remove it from beneath the muscle. It seemed to lie directly on the surface of the femur, but was not attached to the periosteum. During the excision there was at one time a gush of a small amount of bloody fluid. The tumor was a flat, oblong mass, nearly an inch thick and about the size of a woman's hand, looking as if it were composed of fibrous and fatty tissue. During the extirpation, the tumor at times was difficult to find by reason of the spongy tissue becoming collapsed. I found—as I expected from the nature of the dissection—an opening into the upper part of the synovial cavity of the knee-joint. I washed out the knee-joint with a solution of corrosive chloride of mercury 1 : 8000, and followed this by free irrigation with sterile water. The incisions in the external and internal vasti muscles were closed by buried catgut sutures. A drainage-tube was introduced into the lower angle of the external incision, lest the knee-joint should become the seat of septic accumulation. The skin incisions were closed with silk sutures and a dry antiseptic gauze dressing applied.

This operation was done on January 11. The temperature on the following day reached 101.2° F. Inspection of the wounds showed evidence of suppuration in the superficial portion of the internal wound. The external wound was free from contamination. The proximity of the operative field to the knee-joint made me anxious. I therefore freely opened both wounds, but did not disturb the buried sutures which brought the muscular tissue together. Hydrogen dioxide and corrosive chloride of mercury solution, 1 : 1000, were used for irrigating the wound twice a day. The temperature fell to normal under this course of treatment, though it took several days to reach that point. Fortunately, no deep suppuration occurred and no inconvenience resulted, except that the healing of the wound was delayed by the fact that the edges were not in apposition.

The spongy character of the growth was evident after extirpation, and during the dissection showed this characteristic very markedly, because pressure on the tumor caused its collapse very much as in an angioma. The patient had some stiffness of the knee for several weeks after the wounds had healed, but when seen some months later had perfectly recovered flexion and extension.

The specimen at the present time, after being in alcohol for about ten months, seems to me to present the macroscopic appearances of an angioma. The growth, which is, of course, much shrunken by its long soaking in alcohol, is four and a half inches long by two and a half inches wide, and about an inch in thickness at its thickest part. It is an elliptical mass, flat on one surface and convex on the other. It is a good deal damaged by handling and the removal of portions for microscopical examination.

The greater portion of it is covered with a tough fibrous capsule, which evidently originally surrounded the entire tumor. The capsule can be separated from the contained mass by tearing it loose with the fingers. On pressure the growth has a spongy feel, and it is of a yellowish-white color. In some places the yellowish tint is quite marked. In certain portions the surface is bluish. This is especially so in one place on the flat surface where the capsule has been lost. The surface is covered by a shining membrane similar in appearance to the interior of a large vein. This appears to be the lining of a sinus or venous cavity, the remainder of whose wall has been torn away.

About one-half of the mass is somewhat harder than the rest, and when the capsule is peeled off is white in color and fibrous in texture. Incisions into this tissue lay open numerous small canals resembling blood-vessels of a venous character. The tissue between them is irregularly white and yellow in color, the white tissue being tough, the yellow tissue being more friable. There is little doubt that this structure is made up of venous canals and intervening fibrous tissue.

The remainder of the tumor is not quite as hard as the white portion just described, and is made up of irregularly placed bands of white and yellow tissue showing a somewhat similar spongy structure. At one end of the growth there is attached to the surface what appear to be muscular fibres bleached by the action of the alcohol. This evidently was torn from the muscle under which the tumor lay.

Section of the yellowish-white tissue just described lays open

small and at times quite large cavities lined with what appears to be a serous membrane similar to the endothelium of veins.

The blue surface mentioned in the early part of this description lines a hollow on the flat surface of the tumor about half an inch long and an inch wide, and looks like the interior of a large vein. To it are attached a few yellowish masses that resemble fibrin. On the surface of the blue serous membrane are seen openings like entrances to small channels. These are evidently orifices of small branches, which are connected with the vein or sinus, the interior of which is exposed. Into some of these are prolongations of the yellowish fibrin as if a fibrous clot occupying a large blood cavity had sent prolongations into its smaller branches. Careful examination shows this condition in various spots.

It is clear that there has been fibrous deposition in a blood cavity, and that prolongations have entered the smaller communicating vessels. Before the tumor was handled and pulled apart during the extirpation and examination, it is possible that this may have been a large cavity. It does not seem to me to have a true wall such as would be expected if it were a portion of a vein which had been cut off in the removal of the tumor. It is possible that the gush of bloody fluid occurring during the excision came from this venous sinus; though it may have been serous fluid escaping when the synovial cavity of the knee was torn open.

With the specimen is a small fragment removed at the same time as the main portion of the tumor just described. It is yellowish-white in color and on section shows small cavities separated by fibrous partitions.

The macroscopic examination as well as the clinical observation inclined me to believe that the tumor, which is now in the Mütter Museum, was an angioma; but I am told by Dr. McFarland that there is too much fibrous tissue in it for it to be properly denominated an angioma. He suggests the name fibro-angioma.

I do not know whence the tumor originated. It lay beneath the four-headed extensor muscle. It may have been developed on its lower surface or within its lower fibres. It is quite possible, I presume, that it may have taken its origin from the interior of the bursa lying beneath the four-headed extensor. In such a case the fibrous capsule may be the thickened and developed bursal wall.

The tumor was referred to Dr. S. S. Kneass, who reports as follows:

"I have made sections from a number of portions of the tumor in question, with the same result. It seems to be made up of fibrous connective tissue and new-formed blood-vessels. At one place there was little of this connective tissue, but much round cell collection, with giant cells,—granulation tissue. Could it not be a simple tissue new formation consequent upon an old injury, with hæmorrhage? There is a great deal of hæmosiderin throughout the sections. Was there any history of injury, and if so, how long after did the tumor occur?"

There was no history of injury, as suggested by Dr. Kneass, and I have found none on subsequent inquiry of the patient. I doubt if the explanation offered in the latter part of his report can be accepted. The above microscopic report seems to me to indicate that the tumor is an angioma, somewhat similar to those described some years ago by Campbell de Morgan.[1]

It is said that when the vessels of angiomas increase rapidly in size and number they are apt to be surrounded by a richly corpuscular tissue.[2] This may account for the round-cell collection mentioned above.

de Morgan refers to a number of cases somewhat similar to the one which I report. His first case was that of a young girl, ten years of age, who had a tumor lying just below the popliteal space about the size and shape of a small hen's egg. The tumor gave pain when the patient was standing or walking and also when it was handled. When she lay down the swelling became much less prominent; it almost disappeared when the leg was raised or flexed during the recumbent position. It became prominent and tense when the patient stood again. No pulsation, thrill, or bruit could be distinguished in it. The growth had been noticed from the time of her birth, and subsequently increased in size.

The operator removed the tumor by a vertical incision.

[1] British and Foreign Medico-Chirurgical Review, January, 1864, p. 187.

[2] Augustus J. Pepper's Elements of Surgical Pathology, p. 436.

After division of the skin and fascia, an extremely thin layer of the fibres of the gastrocnemius had to be dissected from the tumor. The growth was then readily enucleated. There was no hæmorrhage. The microscopic examination showed the growth to consist of cavernous tissue, which was not made up of hypertrophied normal vessels, but seemed to be a new formation.

de Morgan refers to a similar tumor which he removed from the thigh of a middle-aged woman. The growth was not larger than a small walnut and was situated near the middle of the front of the thigh. He was obliged to cut through the fibres of the rectus, in the posterior portion of which he found the growth embedded. It proved to be a small tumor of mixed erectile and fibrous tissue with a fibrous investment separating it from the muscle in which it lay. He reports that in both these tumors muscular fibres more or less degenerated were found mingled with the fibrous and cavernous tissue.

Liston reports a similar case in which he removed a tumor from the popliteal space of a boy of ten years.[1] The tumor seemed to be connected with the semimembranosus muscle, and was first noticed when the child was two years old. At one time it had shown distinct pulsation. It was as large as a turkey's egg.

Dr. J. Bland Sutton states that a specimen of a cavernous nævus from the semitendinosus muscle is preserved in the museum of St. Bartholomew's Hospital.[2]

Demarquay[3] mentions an erectile tumor in the supinator longus which was removed from a woman twenty-eight years of age. It had been noticed for nine years and was the seat of pain radiating to the shoulder and neck. He refers to similar tumors in the posterior muscles of the neck, in the rectus of the thigh, and at the inferior and external part of the thigh occurring in the practices of Maisonneuve, Denonvilliers, and Béraud respectively.

In de Morgan's article there is reported the case of Shaw,

[1] Medico-Chirurgical Transactions, Vol. XXVI, p. 120 (1843).
[2] Tumors, Innocent and Malignant, p. 160.
[3] L'Union Médicale, 26 Décembre, 1861, p. 587.

who removed a tumor consisting of fibrous and cavernous tissue from the infra-axillary region of a girl of seventeen.

Coote[1] found a growth similar to that which I have described in this paper, underneath the deltoid muscle. At the time operation was undertaken he believed it to be a fatty tumor between the deltoid and the skin. He was obliged to dissect through the deltoid and then found a vascular mass embedded in its substance. The patient was a little girl and the swelling was congenital.

Bryant[2] says that Howse excised in 1892 a non-encapsuled erectile tumor from the biceps muscle of the thigh. The patient was a woman, aged twenty-three years, and had observed the growth for eight years. A good recovery with free movement of the limb ensued.

An angioma "undergoing a fibrous transformation, and which was probably congenital," was removed by Agnew from the side of a young woman.[3]

Senn[4] removed a cavernous angioma of five years' duration from the thigh of a boy, aged sixteen years. It extended from three inches above the patella upward for ten inches over the outer aspect of the thigh. The swelling was oblong and very prominent and firm when the patient was standing, but disappeared almost entirely when the boy was in the recumbent position with his leg elevated. Upon operation it was found that the growth involved the outer part of the four-headed extensor. A number of vessels the size of a crow-quill were seen, and the profuse hæmorrhage which occurred required about fifty ligatures. The patient made a good recovery and had perfect use of the limb. The case differs from the one described by me, and those reported by de Morgan in that there were large vessels to be ligated. de Morgan calls particular attention to the fact that in his own cases the hæmorrhage was very insignificant, and that no definite vessels seemed to act as feeders to the growth.

[1] London Medical Gazette, Vol. x, p. 415 (1850).
[2] Practice of Surgery, Am. Ed., 1885, p. 802.
[3] Principles and Practice of Surgery, Second Ed., Vol. III, p. 389.
[4] Pathology and Surgical Treatment of Tumors, p. 457.

In my case there was no special blood-supply requiring numerous ligatures.

The diagnosis of these unusual tumors of muscle is often difficult. Coote believed that the tumor in his case was a lipoma. Maisonneuve made the diagnosis of fatty tumor under the trapezius in the patient to which Demarquay alludes. Liston's case gave a sensation like the fluctuation of deeply-seated pus, though Liston himself thought it probably a fatty tumor in the popliteal space. In my case I felt quite sure that I had a collection of fluid to deal with. I was much astonished not to obtain fluid by the introduction of the aspirating needle and trocar. The great depth at which the growth was situated made it difficult to determine its exact size and character. The manner in which it collapsed after I had cut through the vastus muscle makes it seem probable that a more careful examination, prior to operation, might have shown me that the prominence of the swelling was increased when the patient was on her feet. There was no pulsation, no thrill; and no increase due to change of position observed by me previous to operation. The non-observance of such symptoms may have been due to the fact that I felt sure that the condition was one in which there was a fluid accumulation. It was evident that it did not involve the interior of the knee-joint, and I had made up my mind that it was a chronic bursitis; there was a possibility of there being a little fluid in the joint, for the patella seemed to be floated up from the condyles of the femur.

de Morgan considers that there are three forms of vascular tumor found in muscle: those which have the appearance of varicose veins; those which are formed of erectile tissue lying in and encroaching upon the muscular tissue, from which there is no definite separation; and, finally, the clearly-defined tumors of erectile tissue which are embedded in the muscular tissue and have an investment of connective tissue. He calls attention to the fact that these cavernous tumors in muscle appear to show a predilection for the lower extremities. Out of seven cases mentioned by him, five were so situated. The case reported by me accords with this rule.

Since preparing this paper, I have received from Dr. Joseph McFarland the following report on the tumor, which was referred to him by Dr. Kneass, whose preliminary report I have given above.

"Dr. Kneass and I have been discussing it, and I have concluded to class it with two similar tumors which have come to me as fibromata of traumatic origin. The entire structure consists of areolar tissue rich in well-formed blood-vessels, and richly pigmented in parts.

"I account for the pigmentation by supposing that frequent interstitial hæmorrhages have taken place in the tumor, the pigment resulting from the destruction of the blood-corpuscles.

"Here and there in the tissues there are small areas of round cell infiltration. There is really nothing extraordinary about the growth except its atypical structure, which makes it difficult to classify and more difficult to name. . . . As you know, the morbid growths are either likely to be poorly supplied with blood-vessels, or supplied with vessels with badly-developed walls. The former condition predisposes to the common degeneration, the latter to interstitial hæmorrhages when the least traumatism is exerted."

Dr. McFarland, as I stated above, finally advised me to apply the term fibro-angioma to the tumor.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, January 22, 1896.

The President, FRANK HARTLEY, M.D., in the Chair.

CASE OF RECOVERY FROM GUNSHOT WOUND OF THE INTESTINE.

DR. GEORGE WOOLSEY presented a patient who had recovered from a gunshot wound of the intestines, the details of the case are given on page 423.

DR. F. W. GWYER said that he had been impressed by the value of normal salt solution three or four years ago in a case of two gunshot wounds of the stomach which had been inflicted soon after the man had eaten a meal of corned beef and spinach. On opening the abdomen its contents were found flecked here and there with undigested spinach extending to a great distance from the wounds. He used a large quantity of salt solution, thoroughly flushing the abdomen. After closing the wounds the patient made an uninterrupted recovery, although shock was rather marked. He had always thought that the advantage of the salt solution was twofold; (1) rendering the abdominal contents thoroughly clean; (2) relieving shock.

BILATERAL PERINEPHRITIC ABSCESSES.

DR. HOWARD LILIENTHAL presented a man, thirty-five years of age, with the following history: He had been admitted to the Mount Sinai Hospital January 8, 1895, and discharged February 14, after treatment for hæmorrhoids and pneumonia. Readmitted April 2 after three weeks' illness, beginning in chill and vomiting, later headache, anorexia, prostration, pain in left lumbar region. Often chilly sensations followed by sweating. No urinary symptoms. Examination revealed a mass supposed to be an enlarged spleen. It was not very tender; no spots; temperature 101° to 103° F. On the 10th

of April the temperature was 104° F. It was treated as a case of typhoid fever. April 23 the urine contained trace of albumen, epithelium, and leucocytes. April 28, chill, temperature 104.6° F. The next few days there was much vomiting. April 30, urine cloudy, acid, few hyaline casts. May 4, urine negative. May 7, more than a month after admission, fluctuation detected in "splenic region." Succussion sounds on deep palpation. He was then transferred to the surgical side.

Operation.—Patient very weak, profound anæmia, afraid to operate under general anæsthesia, cocaine was used. A large incision into the tumor in lumbar region proved it to be an enormous abscess. May 28 the urine was negative. Abscess drained and dressed in the usual way. June 3 temperature, never having been normal, rose to 102° F. The urine contained a little pus. June 4 an abscess was opened in the muscle on the anterior thigh. June 7 pus was aspirated from right loin, and June 28 the right loin was opened under cocaine and an enormous abscess was disclosed, similar to the one which had been opened on the left side and for which just as little cause could be ascertained. June 16 another abscess was opened, this time in inguinal region. June 17 urine contained pus and epithelium. July 25 it contained trace of albumen and trace of pus. August 28 he was discharged cured.

Dr. Lilienthal said his reason for showing the patient was that one did not frequently see recovery from pyæmia in the adult, and also because he thought it might be classed among those referred to in his paper read at the last meeting. In other words, he believed these abscesses following typhoid fever and other infectious diseases might very well be pyæmic abscesses of the cortex of the kidney, with later perforation of the cortex and consequent perinephritic abscess. This patient was now well and attended to his affairs.

SUCCESSFUL RESECTION OF SMALL INTESTINE FOR SARCOMA WITH INTUSSUSCEPTION.

Dr. Charles McBurney presented a woman, forty years of age, who was admitted to the Roosevelt Hospital on November 28, 1895, with the following history:

On September 6, 1895, general sharp, shooting, abdominal pain was noted for the first time. The pain was thought to be most severe in the lower abdomen to the left of the median line. Such attacks of pain recurred almost daily, until within the few days preceding

admission to the hospital; no nausea or vomiting occurred. The abdomen was frequently distended and tender to pressure, but no constipation existed.

Frequent desire to empty the bladder with some disability to do so had been marked at the time of admission; some tenderness to pressure over the head of the colon, and also at a corresponding point on the left side was noted. The abdomen was soft and flat. By vaginal examination a considerable, very tender, perfectly smooth tumor could be felt occupying the deep left pelvis.

On admission the temperature was 99.4° F., the pulse 102.

Slight fever was noted after this every day. The diagnosis of probable suppurating ovarian cyst having been made, operation was proceeded with December 4, beginning with a median incision five inches long below the umbilicus. The hand readily discovered a smooth tumor, three and a half by two inches, which was readily drawn out of the wound.

This proved to be a tumor contained entirely within the small intestine and producing a well-developed intussusception from the proximal side. Incision through the intestinal wall revealed the surface of an ovoid tumor, somewhat sloughy at the lower end and clearly originating in the submucous tissue. The pedicle of the tumor was quite small, not more than one and a quarter inches in diameter.

A resection of six or seven inches of intestine, including the tumor and intussusception, was made and the divided ends approximated with a large Murphy button. The intestine was then returned to the cavity and the entire wound closed without drainage. No fever or other incident occurred. The button was passed on the eighteenth day after operation. The patient was discharged from the hospital on the thirty-first day.

The tumor proved, on examination in the laboratory of the College of Physicians and Surgeons, to be a myxosarcoma.

Dr. McBurney added that since the operation the patient had entirely recovered her health and had had regular movements of the bowels. The absence of constipation prior to operation was explained by the presence of a narrow passage along-side the tumor which established communication between the bowel above and below the tumor and intussuscepted portion.

Dr. Woolsey said he thought it remarkable how large a tumor and how narrow a stricture one sometimes encountered in the intes-

tine without symptoms. He recalled a case in which there was a circular constricting tumor of the splenic flexure of the colon. When the history was taken before the operation the man said he had never had any trouble whatever except some stomachache on one occasion after drinking, which was relieved by a mustard foot-bath. When he came to the hospital the abdomen was enormously distended. On opening it the intestines were found very much distended, congested, and soft, and in handling them a perforation was made. As his condition did not justify further interference, an artificial anus was made at the point of perforation. The patient died and the specimen obtained post mortem showed a circular constricting carcinoma of the splenic flexure, so small that the tip of one's finger could not be introduced, yet he had not complained of constipation and the movements had been regular.

Dr. Willy Meyer mentioned the case of a woman, aged forty-six, who was admitted to hospital during the summer of 1894, with symptoms of subacute appendicitis,—pain in the iliac region for ten days, some elevation of temperature. On the fifth day after admission she suddenly developed the symptoms of ileus. She was operated upon within a few hours, and he found an intussusception in the lower ileum, near the ileo-cæcal region, which, after some traction, was pulled out. A second intussusception was then found at the proximal end of the extracted portion which was also reduced, and then a movable sessile tumor could be felt within the intestine. The gut was pulled out at this point, opened, and the tumor portion for about three inches was resected, and the cut ends united by a Murphy button. A fæcal fistula formed, but was closed after a few days, and the patient made a good recovery. There had been no recurrence. The tumor was a sarcoma.

About six weeks later a boy was admitted to the hospital who had been seen by a number of physicians. On entering his room a loud gurgling sound could be heard, and on inspecting the abdomen one could see the peristaltic movements. It seemed evident there was obstruction somewhere in the intestine, and palpation placed it in the ileo-cæcal region. Operation showed intussusception in the ascending and transverse colon. Extrusion was tried, but the serous membrane tore, and as nothing else could be done he resected the entire ascending colon. Murphy's button was used for anastomosis, and was passed the eleventh day. A good recovery followed. The tumor was a sarcoma seated within the lower end of the ascending

colon. The patient subsequently went to the country, emaciated, and died. Post mortem on the patient showed multiple metastases. Dr. Meyer believed that most new growths within the intestine were likely to cause intussusception, and when the latter condition was found one should examine for malignant tumor.

DISLOCATION OF THE HUMERUS, COMPLICATED BY FRACTURE AT THE ANATOMICAL NECK. CASES OF SEPARATION OF THE LOWER EPIPHYSIS OF THE FEMUR TREATED BY OPERATION.

DR. CHARLES MCBURNEY read the paper with this title, for which see page 501.

DR. L. A. STIMSON thought Dr. McBurney's method of treating fracture of the surgical neck of the humerus with dislocation of the upper fragments was a very important addition to our resources. Whether it was likely to be so much needed in fractures of the anatomical neck was doubtful. It was not possible to speak positively where experience was so limited. In the case related considerable time had elapsed since the injury had been received, and probably no non-operative method of treatment would have succeeded in bringing the bone into place. He believed the author had expressed the opinion that, on account of the small size of the upper fragment, the difficulty of reduction without operation in fracture of the anatomical neck was greater than in fracture lower down.

His own experience with these cases had been limited, but so far as it had extended he had found it easy to reduce the fragments, under ether, by simple manipulation, making traction on the arm in abduction and pressure on the upper fragment with the fingers. In this manner he had been enabled to make reduction very readily in two cases, and had not met with any other case in which reduction could not be made. When one reflected on the anatomical conditions present he would naturally suppose that reduction could thus be made. The shaft could be drawn away to such a distance as to leave the necessary space for dislodging the head from its new position beyond the edge of the glenoid cavity, which it would then readily enter.

The two cases of separation of the lower epiphysis of the femur treated by operation were very interesting. The fact that the stripped

up periosteum remained largely continuous with the epiphysis was an important one, and had been observed by himself and mentioned by Dr. McBurney and others. He should think the presence of such a strong band of periosteum would add to the difficulties of reduction as experienced by Dr. McBurney, and the thought had suggested itself to him that reduction might have been made easier by bending the lower segment towards the side on which that strip lay, so as to relax it.

Dr. McBurney found it very difficult to say why it was that in a good many of these cases of dislocation there was so great resistance to reduction, but the same thing was true of a good many ordinary dislocations. The enormous difference between cases was not readily explained. There were some dislocations which could be reduced with one hand; there were others which, apparently, did not differ much from them in the nature or extent of the lesion which required quite powerful extension and long-continued manipulation. One thing was certain,—namely, that very skilful persons had sometimes made prolonged effort to reduce the head in fracture of the anatomical neck of the humerus, with dislocation, and without success. In his own case, he did not think the length of time the head had been out of the socket could account for the resistance to reduction. There was no tearing of tissue in replacing the head. It was simply buried deeply below the edge of the glenoid cavity, surrounded by the soft parts, and the difficulty was in dislodging it and carrying it out and over the edge into the cavity. He could readily understand that a fresh dislocation could be reduced by manipulation more easily than an old one, but in the one under consideration it was not the age of the case so much as the deep burial of the head in its unnatural position.

If extension of the humerus was so valuable in reduction of shoulder dislocations complicated by fracture of the anatomical neck, why were not most subcoracoid dislocations reduced by extension and finger manipulation in the axilla. He had himself reduced a good many cases in this manner, even without the use of an anæsthetic, but he had had other cases in which the method would not answer at all. He believed that Dr. Stimson's experience in the two cases of dislocation with fracture of the anatomical neck had been exceptional. Dr. Stimson's remarks would seem to justify the inference that he considered dislocation complicated by fracture easier of reduction than simple dislocation.

DR. STIMSON added that where the tear of the capsule took place there was an attempt at repair, and the condensation of this tissue, with that of what probably had been thrown out below the head, must have formed a bed of cicatricial tissue which constituted a part of the difficulty in reduction. In his first case, which entered the hospital shortly after Dr. McBurney had read his first paper, he went down with considerable self-felicitation, at the prospect of trying the method, but found he was able to reduce by manipulation.

DR. MCBURNEY would again call attention to the number of cases reported. Out of some eighty cases which had been treated by manipulation, reduction had been effected in thirty-eight, failure in forty-four. This showed, of course, that manipulation would sometimes succeed, but where it would not other methods were required. In no case should a major operation be made use of for reducing dislocation which could be reduced by any manipulation of justifiable amount. But he might add, in this connection, that an operation such as he had described was infinitely less grave than the great amount of manipulation which had again and again been practised, and still was frequently practised, in reducing dislocations. He had seen a good many cases where, as he was informed, the heel had been used in the axilla, and the appearance of the patient was such as to thoroughly justify the statement. Severe traumatism had been caused by attempts at reduction which had not succeeded. Of course, the question of proceeding to any operation must rest with the judgment of the surgeon. He felt warmly, however, that a method of this kind was very much to be preferred to any which meant laceration or contusion of deep parts. Some felt that the reduction of hernia by any amount of manipulation was preferable to an operation, but surgeons knew this was not so. In either case, if reduction could be made by a safe amount of manipulation it should be done, if not, one should operate.

RESECTION OF INTESTINE FOR GANGRENOUS HERNIA; DEATH.

DR. HOWARD LILIENTHAL showed a specimen from a woman of sixty-eight, who had had umbilical hernia which became irreducible. He was called by her physician three days later. Pain in the region of the hernia had gradually disappeared, but vomiting persisted. He operated the same afternoon, found a piece of gut largely gangrenous for a distance of five inches. He resected eight inches and inserted

a Murphy button. There was much fat, the operation was more or less difficult and prolonged, the patient partially collapsed while he was pressing the two parts of the button together, and for this reason and the fact that the gut here was thin, so injury to its wall was feared, he hastened and did not press the halves firmly and fully together. He mentioned this to show that undue pressure had not been inflicted. The patient left the table in miserable condition, fæcal vomiting continued, but became less and less, and by the end of twenty-four hours she had rallied well. He learned after the operation that she had glycosuria, and then discontinued morphine and gave codeine, all medication being hypodermic. The urine now gradually diminished, and instead of increasing in specific gravity, it fell to 1017, sugar steadily diminished, the patient passed into coma, and died on the fourth day. No autopsy was permitted, but the piece of gut containing the button was secured. It showed considerable gangrene at points near the button, especially on the more congested side. The adhesions between the ends of gut were not good except at the mesenteric side. No peritonitis. He was of the opinion that the gangrene was due to the pressure of the button.

Dr. Meyer could not agree with the view that the button itself was the cause of the gangrene, for it is never seen in cases in which the gut was healthy, even where a good deal of pressure was used in bringing the halves together. He had lately had a case in which he found commencing gangrenous spots in the proximal portion of the gut fully twenty inches from the point of constriction in a strangulated hernia which had existed three days, and he believed that had Dr. Lilienthal pulled out more gut he might have found such spots beyond the points at which he had resected, and this would account for the gangrenous portion found after death. There would have been less danger had a longer piece of gut been excised.

Dr. Lilienthal said he resected at points where he believed the gut was healthy, and this was the view of Dr. Mundé, who was present at the operation. At first he cut away six inches, and then two inches more at the end where there seemed most congestion.

Dr. W. B. Coley said that at a recent visit to the Buffalo General Hospital he had seen a specimen very similar to this, although the operation had not been done for gangrenous hernia. The button had caused gangrene, and could easily be seen shining through the gut. The surgeon who showed it said it was the fifth of the kind which had occurred.

TRANSACTIONS OF THE SECTION ON GENERAL SURGERY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA.

Stated Meeting, December 13, 1895.

DR. OSCAR H. ALLIS, President, in the Chair.

FRACTURE OF THE CORONOID PROCESS OF THE ULNA.

DR. THOS. F. BRANSON described, by invitation, a case of fracture of the coronoid process of the ulna.

DR. PILCHER stated that he had never had any experience with this condition. Dr. TIFFANY and Dr. ASHHURST had never been able to recognize this fracture. Dr. DEAVER and Dr. MEARS had likewise never seen a case.

DR. T. S. K. MORTON confirmed the facts as detailed by Dr. Branson, and stated that he was entirely convinced that their case was actually one of that rare injury.

DR. THOS. G. MORTON stated that in the records of the Pennsylvania Hospital, among 150 cases of fracture of the ulna, there were three which were put down as fractures of the coronoid process. He believed, however, that the diagnosis in these cases had been erroneous.

DR. ALLIS remarked that the lower humeral articulation was so exact that a dislocation was out of the question, without, as a rule, extensive laceration of the lateral ligaments. In experimental work he had chiselled away little by little the coronoid process, making with each lessening of the coronoid an attempt to dislocate, but found it impossible even after its complete removal to dislocate the ulna backward without an extensive laceration of the lateral ligaments. He believed that when dislocation backward occurred through leverage or twist that the violence explodes chiefly upon the lateral ligaments, and under these circumstances the coronoid escapes, or, if

injured, only the tip is broken off. The history of Dr. Branson's case would indicate that the violence was through direct thrust, in which case the force exploded upon and was divided between the coronoid process and the head of the radius. In many instances the force exerted through the radius causes fracture of the external condyle, and the ulna may then be carried backward without further lesion. In the present case the head of the radius was dislocated backward after the violence had broken off the coronoid at its base. The pathology of all these lesions is in a measure conjectural, inasmuch as an open and critical examination immediately after the injury is never permissible.

DR. HARTE stated that some years ago, in the preparation of a large number of bones in the Anatomical Department of the University of Pennsylvania, to be used for skeletons, he found a number of fractures of the scapula, but observed none of the coronoid process of the ulna. The former is regarded as a bone that is seldom broken, consequently, if the coronoid were fractured as often as we might be led to suppose, more examples of it would be found in our museums.

DR. G. G. DAVIS reported a case from injury in which extensive comminution of the humerus existed, but he never saw a case of simple fracture. Naturally, a comminuted case would differ somewhat from a simple case. The process was not fractured towards its base, but there was simply a small piece of bone detached, which remained adherent to the tendon of the brachialis anticus: the process widens so rapidly that it looks almost impossible for it to be fractured low down towards its base. No doubt in most cases the fracture occurs, as was shown in this case, merely the tip of the process being broken off and remaining attached to the capsule and tendon.

THE TREATMENT OF COMPOUND FRACTURES OF THE LOWER EXTREMITY.

DR. L. MCLANE TIFFANY gave a description of his treatment of compound fractures of the lower extremity. Dr. Tiffany limited his remarks to four indications for treatment. The first is the cleansing of the limb; the second is the strangulation which will follow the swelling which is pretty sure to take place consequent upon the injury; the third is the bringing of the parts together; and the fourth, the encasing of them or the putting on of such an apparatus as shall sustain the fragments until definite union shall have occurred.

The question of disinfection. Every compound fracture is, of course, an infected wound, whether it be the vulnerating force from without, a car-wheel, or machinery, or what not, which forces dirt into the wound, or whether it is the bone which comes from within and perforates the skin. Dirt will be brought in contact with the denuded surfaces from the patient's clothing in all probability in the lower extremity, and if not, unquestionably it will be from the undisinfected skin of the patient, so that it may be accepted that a compound fracture is a dirty wound from its commencement, and the question of disinfection has to be considered first.

The practice generally followed by Dr. Tiffany as a matter of routine is as follows: The patient is *always* anæsthetized in every case of compound fracture of the lower extremity. The injured leg is shaved and scrubbed for quite a time with a stout brush, soap, and hot water, probably five or ten minutes, and not only the seat of injury is so treated, but the limb quite a distance above and below the seat of injury. In compound fracture of ankle the leg will be cleansed to above the knee. In compound fracture of thigh the cleansing includes shaving of pubes, perineum, and anus, etc., going probably as far as the anterior superior spine of the ilium. If there is grease upon the surface it is cleansed by turpentine; that is the substance Dr. Tiffany uses to take off the grease which in machinery and railroad accidents is always present. The wound in the soft tissues is enlarged and everything under the skin is cleansed with soap and water and nail-brush precisely in the same way as the skin, save and excepting the shaving. He does not use turpentine upon the denuded surface because it burns for a long time, but cleanses raw tissues of oil and dirt by ether, and the wound is enlarged wherever necessary so as to completely clean the patient.

For the swelling which is going to take place, the skin does not, but the deep fascia does decidedly limit the swelling of the limb and produces constriction, wherefore it is very freely slit open. Where a tibia and fibula are broken, the tibia compound, he makes a free opening over the fibula six or seven inches long, or as long as may be necessary, through deep fascia, and all the more necessary is this if the fibula fracture is compound. If he has any doubt as to the wound he slits up the fascia more extensively than the skin. The reason of this is apparent, the organs of the limb run lengthwise, each is in its own sheath, hence the extravasation of blood and the exudation will run up and down the limb and not find a way out.

He frees bones so that they will be movable, thus avoiding tension, present and future.

Dr. Tiffany does this because he finds infection takes place in compound fracture, so there must be some inflammation. When there is cellulitis in the hand it extends up the forearm, and in its treatment long incisions are necessary not only at or near the seat of the wound, but carried up the forearm as far as the greatest extension of the inflammation and passing through the deep fascia. Whether it is above the knee or below the knee he treats it in the same way, the fascia of the thigh is laid open quite as extensively.

The bones should come easily together. If there is much deformity he wires bone and leaves wire in; if there is not much tendency to deformity he stitches with fine silk the periosteum and leaves it, giving himself no trouble about the wire or about the silk which is left in. The wire may require removal, but the silk never is heard from.

Then the putting of the limb in position. Perhaps it may be wise, if there is much laceration, to use an apposition suture of fine silk inside the limb, just to hold the wound lightly together, but the wound is never closed under any circumstances. Then he puts on a voluminous dressing of sterile gauze,—he does not use iodoform,—then cotton, and then plaster-of-Paris bandage. In fractures below the knee, he carries the plaster-of-Paris bandage from base of toes up to knee, unless the knee is injured. He puts the plaster-of-Paris bandage on moderately snugly, just how snugly is a matter which is decided by the hand of the surgeon who puts on the bandage. Dr. Tiffany always suspends the limb from the ceiling, because it is more or less heavy, and injury might follow motion on the patient's part; at times an anterior splint is employed or simply a rope with a loop or two holding the limb; it is raised three or four inches above the bed. When the patient pulls himself up in bed his leg does not drag along the pillow. He does all this before the patient recovers from anæsthesia, who wakes up in bed with his leg in a stiff casing hung up to the ceiling. The limb is left in suspension without inspection of the wound for several weeks. Generally speaking, Dr. Tiffany does not have to touch his case for a number of weeks. At the end of six weeks a certain amount of shrivelling contraction can be found, but the leg swings and the patient is comfortable. Finally, the splint is cut open, and a section taken out in front, while behind it is nearly cut through so as to act as a hinge, a bandage put on and the man gets up on crutches.

In compound fractures of the thigh the same general treatment is carried out, and Dr. Tiffany decides whether the patient is to have his leg in a long splint or Buck's extension, or whether it is to go up in a suspensory apparatus, which can be equally well supplied after this dressing. It must remain a number of weeks without being touched; when he takes off the plaster-of-Paris casing he expects to find a granulating wound level with the skin. The extravasation of blood is pretty certain to take place, and, of course, the white plaster splint becomes purple, but that is a matter which gives him no concern.

By the patient's temperature and pulse he judges whether patient requires another dressing. Always for a day or two at first the temperature goes up and then drops to normal. The small variations that take place in the treatment indicated will depend upon the appearance of the fracture, the amount of the wound, etc. The first and most important thing is the cleansing, the second is the unbridling,—that is, the thorough cutting of the deep fascia which allows of swelling, after which patient goes on without much trouble.

In reply to a question as to the propriety of making compound fractures out of simple ones, Dr. Tiffany said that he had had very few such cases. His reason for making a compound fracture out of a simple one would be inability to keep the fragments together. It is not clear why a compound fracture should be made out of a simple one except a failure to keep and hold in coaptation the bones. Because a bone comes under the skin and does not quite perforate is no reason for pushing it through. He endeavors to place it in position, and is grateful if it is not a compound fracture.

Dr. Ashhurst called attention to certain points to which Dr. Tiffany had not alluded, but in regard to which his views would probably not materially differ from those held by the majority of surgeons. It is hardly necessary to speak of the first question which always arises in regard to compound fractures, whether or not it will be possible to save the limb. In connection with this there is, however, another secondary question, which is of very great importance, and that is as to the management of the splinters which are met with in compound fractures. Dr. Ashhurst has been in the habit of recognizing three divisions, founded on Dupuytren's classification of splinters into primary, secondary, and tertiary. The primary splinters should be immediately removed, while the tertiary splinters, those which are very closely adherent and merely split off, should be

retained. It is in regard to the secondary splinters, those neither very loose nor very tightly adherent, that the surgeon's judgment must be exercised as to whether or not they should be removed. This is perhaps the most important matter to be considered. What shall we do with these fragments which are split off and which are left in the wound? If no exploration of the wound is made, they are apt to be overlooked, and the primary splinters and a certain number of the secondary will become necrosed, causing delayed union and perhaps requiring a secondary operation for their removal. Therefore he is disposed to favor the view advanced by Dr. Tiffany as to the propriety of enlarging the wound in cases of compound fracture, at least sufficiently to enable the surgeon to make a careful examination with the finger.

Another matter of great importance, not only in regard to prognosis but also in reference to treatment, is the mode in which the injury is caused. Dr. Tiffany did allude to this, but only to say that no matter how the wound was caused it was unquestionably a dirty wound. There is, however, a great deal of difference between a compound fracture in which the bone, broken by a fall, protrudes through the skin and a compound fracture caused by a heavy crushing force which crushes the soft tissues before producing the fracture. Universal experience shows that in the former case the prognosis is more favorable, and that greater risks are justifiable in attempting to save the limb than in the latter.

The only case in which he would think it proper not to enlarge the wound of a compound fracture for exploration would be one of those cases which we occasionally meet with in which the wound is a very slight one, a mere puncture or tear in the skin, and in which there is no evidence whatever of injury to the soft parts in the way of contusion, and no evidence of extensive injury to the bone, and probably no comminution. Cases of that kind probably every surgeon has seen do well without enlargement of the wound, which heals readily, converting the case into one of simple fracture. But Dr. Tiffany is undoubtedly right in saying that in the large majority of cases we should enlarge the wound, particularly in cases of gunshot fracture. Dr. Ashhurst, however, was not prepared to go to the extent to which Dr. Tiffany had in making very extensive incisions. He speaks of making five or six incisions, from elbow to wrist, in cellulitis of the forearm. Dr. Ashhurst has never seen a case in which he thought such heroic treatment justifiable, nor has he

thought it justifiable, in cases of compound fracture, to make the very extensive incisions which Dr. Tiffany speaks of. He believes that if an incision is made of sufficient extent to allow thorough exploration of the wound and removal of those fragments which should come away, followed by complete disinfection, it will be all that is necessary. It is perfectly true that the deep fascia often causes more tension than the skin, and this being so it should be divided as freely as the skin itself, but there is commonly no necessity for very extensive incisions. Dr. Ashhurst was not in the habit of giving an anæsthetic in all cases of compound fracture indiscriminately, the pain produced by the necessary manipulations not always being so severe as to call for such a measure. No doubt, however, an anæsthetic may be needed when the surgeon employs a scrubbing-brush in the deep parts of the wound and douches the raw tissues with ether.

Dr. Ashhurst's plan of cleansing the external surface is much the same as Dr. Tiffany recommends. He likes turpentine much better than ether to remove fatty matters from the skin, and after turpentine, uses soap and water, shaving the part if necessary and scrubbing it moderately without giving pain to the patient, and then washes it thoroughly with a moderately strong antiseptic solution. For the deeper portions of the wound, after removing all loose fragments, it is sufficient to wash them thoroughly with the warm antiseptic solution and secure drainage by rubber tubes or strips of sterilized gauze. As he has not enlarged the wound in the very extensive manner that Dr. Tiffany has described, he has also not resorted to the use of bone sutures as a matter of routine practice. He does not believe it either essential or desirable, and it is a good rule in surgery that what is not necessary should be avoided. Patients get firm union without the bones being sutured, and he cannot believe that it is necessary to use sutures in the large proportion of cases in which Dr. Tiffany tells us that he employs them, though, no doubt, after the very extensive incisions which Dr. Tiffany makes,—leaving the bones entirely loose,—there may arise a necessity for mechanically holding them together.

Leaving the wound open, within certain limitations, is good practice. There can be no greater mistake than to closely sew up the wound in a case of compound fracture, since the tension thus caused is almost sure to result in sloughing. If the laceration be very extensive, possibly a very few stitches may be used to hold its corners

together, but it is commonly better simply to carry a strip of antiseptic plaster around the limb in a spiral direction, so as gently to hold the edges of the wound together, while not interfering with the swelling which inevitably follows.

As regards the dressings, we do not in this city usually employ plaster of Paris in the early stages of compound fractures of the leg, but apply large antiseptic dressings which permit inspection of the wound as often as may be thought necessary, the limb then being placed in an ordinary fracture-box, and care being taken to keep the foot at a right angle with the leg and to prevent eversion of the knee. In cases where there is very great laceration, much benefit may be derived from the use of antiseptic irrigation, dressing the part loosely with antiseptic gauze after proper cleansing, and providing a reservoir at a proper height from which a weak antiseptic solution can be made to flow constantly over the wound, and continuing this irrigation until the dangers of the early stage have been passed and until the wound is granulating, when the ordinary dressings may be substituted.

Dr. Ashhurst said that he would like to add a word in favor of an old Philadelphia dressing, which might still be employed with advantage in some cases in connection with antiseptic measures,—namely, the bran-dressing, introduced by the late Dr. J. Rhea Barton. It may exercise a useful function in cases which fail to do well,—and even Dr. Tiffany tells us that some of his compound fractures do badly, and may be used in connection with either antiseptic irrigation or ordinary antiseptic dressings. It is convenient of application, and though now seldom employed still has a field of usefulness in a few cases. Dr. Ashhurst does not like to trust a case without the possibility of inspection for as long as six weeks, though very often, when all goes well, it is not necessary to remove the first dressing for about three weeks, the use of the fracture-box enabling the surgeon to verify the position of the limb by seeing daily that the ball of the great toe, the inner malleolus, and the inner condyle of the femur are kept in the same vertical plane, and that therefore there can be no axial deformity.

Dr. John H. Packard thought the cardinal principle in the treatment of every compound fracture was to convert it as early as possible into a simple one, by promoting the healing of the wound. This rule of long-standing seemed to him to be of as much importance now as it ever was. But the object is effected in a different way.

We open up the injured parts, by incisions if necessary, and sterilize every recess of the wound, so as to get rid of any infective material.

A small wound, a mere puncture, may be very dangerous, far more so, indeed, than a large one through which wound secretions may find a ready exit. He recalled, as an illustration, a case of compound fracture of the femur which occurred in 1855, when he was a resident surgeon at the Pennsylvania Hospital. There was only a little slit in the fascia lata at the outer side of the thigh. Of course, in those days there was no antisepsis or asepsis as we now know it, and, instead of opening up the deeper tissues, the case was treated expectantly; an enormous abscess developed, and the man died of pyæmia. He believed this to have been a perfectly avoidable fatality.

On the other hand, he did not think we are justified in making recklessly free incisions in any case. Our object is attained if we open up every recess of the wound. The sterilizing may be effected either by swabbing or by irrigating, and best, in his opinion, with sublimate solution (1 : 1000 is not too strong).

Should there be after this a tendency to oozing of blood, it may be well to use a temporary packing of iodoform gauze, not tightly applied, for, perhaps, twenty-four hours.

He did not think it safe to put up a broken limb and leave it for six weeks. After the swelling has subsided and the muscles have become flabby, the part may be but loosely controlled, and when the dressing is taken off it may be found that the fragments are in bad position. Not only on this account, however, did he think it ought to be examined earlier, but he believed that the occasional exposure of the skin to the air, cleansing it well, and applying alcohol or some other stimulant, has an appreciable influence in promoting union.

Dr. Packard said it may seem like heresy for a man connected with the Pennsylvania Hospital to say so, but he disliked the fracture-box, and never uses it except for the first few days. He lays it aside as soon as swelling has subsided. Unless carefully watched, the fracture sags down, and we may have the bowing backward, which is the worst possible deformity, although the line of the limb, seen from above, is correct.

His own practice is to use a strip of sheet-zinc, passing down one side of the leg, round the sole, and up along the other side. This may be easily arranged to suit compound fractures. It is wadded and firmly bandaged on; suspension is then made with a wire splint

like N. R. Smith's, strips of bandage going from one side to the other so as to form a complete cradle for the limb. Any sort of gallows-frame, with a pulley, cord, and tent-block, may be employed. With a leg so treated the patient may safely sit up by the second or third day.

With regard to etherization, he stated that there are many cases of compound fracture in which it is indispensable to the forming of a correct diagnosis, as well as to the efficient carrying out of the reduction and dressing. No surgeon should be satisfied with any but the most thorough examination, cleansing of the wound, reduction of the fragments, and putting up of the limb. When, by reason of the condition of the wound, or from the voluntary or involuntary resistance of the patient, this object cannot be readily effected, anæsthesia is indicated.

Dr. J. Ewing Mears thought Dr. Packard announced very clearly the fundamental principle which underlies the treatment of compound fractures in his statement that the effort should always be made to convert a compound, if possible, into a simple fracture. Discussing the question upon the lines laid down by Dr. Tiffany, Dr. Mears spoke first with regard to the propriety of placing the patient under the influence of an anæsthetic. He believed Dr. Tiffany's statements were correct with regard to this matter. He felt that under all circumstances it is better to place the patient under the influence of an anæsthetic,—it is a matter of justice to the patient as well as of justice to the surgeon. The surgeon under these conditions can thoroughly and carefully explore the wound, can perform such operations as he may find necessary, which he may not have been able to anticipate, but which may become necessary.

In the treatment of compound fractures, Dr. Mears thought Dr. Tiffany probably had mainly in mind the treatment of those very severe forms of compound fractures such as result from the application of very great violence. His description would seem to indicate that such was the fact from the very thorough manner in which he applied his remedies.

The simple compound fracture, if the term may be used, that fracture which is the result of indirect force, not a great crushing force in which possibly the end of one fragment protrudes through the soft tissues, but to a slight extent, in which the surgeon can detect, on examination, very slight injury to the soft tissues, in that form of compound fracture, Dr. Tiffany would not have us understand that

he opened that wound extensively, that he believed it necessary to explore it as thoroughly as in the severer forms of injury, or that he made the incisions which he describes. Therefore we should draw a distinction between these two forms. With regard to the extensive injuries which follow the wound described, Dr. Mears thought Dr. Tiffany's treatment in every respect proper. It is interesting to contrast the experience of surgeons of to-day and of those of twenty and twenty-five years ago. Surgeons were very loath to handle such injuries to any extent, the finger might have been introduced into the wound and carried down to the point of fracture, but such practice as making free incisions and opening up the parts as described was never dreamed of by the surgeon in that day. On the other hand, he was very glad to disturb the fracture as little as possible, to try and get it covered up in some way with a poultice or some form of dressing of that kind and to await results, which were generally infection, pyæmia, and the death of the patient.

Dr. Tiffany's statements with regard to the thorough cleansing of the wound are very important. Such treatment leads to successful results, and deprives the severe injuries which attend compound fractures of the dangers which they would otherwise possess.

In regard to the incisions which he advises and which he practises, Dr. Mears believes these views also are correct, and that that method of treatment also leads to successful results. Free incisions should be made in accordance with the conditions which are present. By means of these the surgeon can inspect the very innermost recesses of the wound, secure cleansing of every part, can relieve tension, and can place the parts freely at rest. These principles are without question correct principles in the treatment of wounds of this kind.

In regard to the treatment of the fragments, Dr. Ashhurst has called attention to this point, and with his statement the speaker fully agreed. Whether it is necessary always to fasten the fragments together by wire or even to fasten periosteum together by silk sutures, as Dr. Tiffany describes, Dr. Mears stated he was not prepared to affirm. In certain instances, it may be necessary in order to obtain proper adjustment and retention of the ends of the fragments, and, of course, the surgeon must be guided in these cases by what he observes is present. As to the dressing, Dr. Mears fully agrees with Dr. Tiffany that there is no better form of dressing for compound fractures than the plaster dressing. He was interested in Dr. Tiffany's statement with regard to the fact that after placing the limb in the plaster

dressing he did not leave a trap-door over the site of the wound for inspection and drainage. Having cleansed and disinfected the wound so thoroughly, and having placed it in the most favorable condition for the reparative process, it may not be necessary to have the wound open. If his experience justifies him in this method of treatment, then, of course, he is justified in so announcing it and advising it, but it seems that in cases where great injury has been inflicted it would be prudent and desirable to have this opening, so that, if necessary, drainage could be afforded and an inspection of the wound made. The suspension of the limb is a feature of treatment which is very necessary to give comfort to the patient.

DR. JOHN B. ROBERTS discussed the subject from three points: First, he did not like the term "compound" fracture, preferring the term "open" fracture as being much more descriptive and less liable to lead to confusion.

Second, He considered splitting the deep fascia, as done by Dr. Tiffany, and thorough cleansing out of clots about the seat of fracture, a most valuable procedure in appropriate cases.

Third, He was thoroughly in accord with the general principle of cutting down upon obscure "closed" fractures for better exploration and coaptation. He made this statement two or three years ago, though he was then not as sure as he is now of the propriety of this method. He will hereafter in selected cases, where he has a "closed" fracture that cannot be properly adjusted, particularly if it be in the neighborhood of the elbow-joint, cut down and make an "open" fracture to see exactly the nature of the damage and to repair it. As an abdominal surgeon he cuts into the abdomen to see what abnormal condition exists, in order to give the patient the best treatment applicable to the lesion. Obscurity in abdominal surgery prevents efficient treatment, and obscurity in closed fractures difficult of reduction often prevents proper treatment and restoration of function. The same general method is applicable in both classes of lesions.

DR. WILLIAM BARTON HOPKINS spoke of a simple method of making a trap-door in plaster-of-Paris dressings. The idea was not original with him, but he has used it for a long time with very satisfactory results. It is always very desirable to have access to the wound, but if anything goes wrong, it is far more satisfactory to be able to reach the wound without removing the entire dressing. Dr. Hopkins's plan is to take a strip of tin from a quarter to half an inch

wide and corresponding in length to the size of the trap he wishes to make. This strip of tin is bent in the form of a circle or an oblong as best suits the case, and is placed on edge surrounding the wound, making as it were a fence about it of the desired size. Within this tin strip and completely filling it is placed a dressing of crumpled gauze. The plaster of Paris is then applied in the ordinary way. The edge of the tin is distinctly perceptible through the plaster, and should be cut upon with a sharp knife before the bandage has completely hardened. The trap-door, if everything goes well, need not be disturbed. It does not interfere with the strength of the dressing. Two strips of ordinary tin of proper width are inserted between the layers of the bandage, and are to be used as a hinge, while the plaster over the balance of the tin rim is cut clear through, the latter may be allowed to remain or may be removed as desired. There is another advantage in using the strips of tin; there is an outward flange given to the bandage at the edge which is very useful in packing in dry absorbent cotton, which Dr. Barton always inserts around the edge with a grooved director as soon as he has removed the tin. That offers an effectual dam to any liquid dressing or washing which may be used for the wound afterwards, and prevents moisture or discharge from soiling the bandage. If the cotton becomes soiled it should be renewed.

Dr. Hopkins called attention also to the matter of the perfect fixation of fragments. He did not think it possible to perfectly fix fragments unless the knee-joint is controlled. He does not think the fracture-box ever controls the knee-joint; the fracture-box anchors the lower part of the fragment, while the patient along with the upper fragment is cast adrift.

Dr. T. S. K. Morton stated that as his skill with plaster of Paris increased he used the fracture-box less and less in fracture of lower extremity. It is now the rarest thing for him to put a leg, unless it is crushed or very extensively injured, in a fracture-box; even these he thinks before long he will be able to place in a cast. The plaster dressing gives more perfect fixation, hence comfort, than the fracture-box. Dr. Morton has not been accustomed to using trap-doors in the casts, believing that he cannot get a copious enough dressing through the trap-door. He prefers to have the cast off and have the leg carefully held while putting on a more extensive dressing. The trap-door is sometimes useful in the final stages of a granulating wound. One other point in regard to the use of plaster in these

dressings: it is good to invariably cut the cast after the plaster has slightly hardened. He finds that he dresses his cases more frequently if the plaster is already cut.

DR. TIFFANY closed the discussion by the statement that in small punctures through the skin the important matter to be considered is what sort of dirt has been put in through the puncture. On general principles, the smaller the gateway the less chance of dirt getting in, but there is no certainty that dirt has not gone through a small as well as a large wound; for that reason it is the speaker's habit always to enlarge a small opening through the skin to clean thoroughly and keep clean as well as he can. If he did not do this he would have to wait three or four days to see whether spreading inflammation would set up. By opening the wound and cleaning he is moderately certain he has a clean wound, and the puncture through the skin is prevented from doing harm.

In regard to extensive laceration and whether the limb can be saved or not, he thinks that is a matter of dirt also rather than of wound. Emphysema and spreading gangrene are unquestionably a bacteriologic disease. Gas-producing bacilli are well known. If not present, we do not have emphysematous gangrene. In every case where spreading gangrene is present there can be isolated in a test-tube the bacillus, so that it is a question of dirt.

In regard to antiseptic irrigations, he thought antiseptic irrigation to be useful in accordance with the amount of hot water that is used, and that the disadvantage of it to be in accordance with the amount of corrosive sublimate used. He thinks hot water is the best antiseptic. Corrosive sublimate has a bad action on the tissues. It produces destruction of tissue. The stronger the antiseptic used the more does it form a film over the exposed surface, and thus protect the dirt which has gotten beneath the surface. Corrosive sublimate does harm to a wound. Hot-water irrigation and scrubbing do good to a wound. Dr. Tiffany laid stress on the fact that he did not use the word antiseptic. He says "so far as I can make things clean." The water is boiled, the instruments are boiled, the gauze is sterilized by steam heat, and the only things not sterilized by steam heat are the patient and the surgeon's hands and forearms. The patient is sterilized by scrubbing and hot water and soap, the surgeon's hands and forearms being treated in the same way.

FRACTURES OF THE LEG TREATED BY THE AMBULATORY METHOD.

DR. EDWARD MARTIN said that in common with most surgeons he had conducted the treatment of fractures on the rest method until the appearance of Bardeleben's paper in 1894. There had been a number of scattered papers dealing with getting patients up at once, but in all cases the experience had been limited. Bardeleben reported over 100 cases of fracture of the lower extremity, including fractures of the patella and fracture of the femur, simple and compound. In all these cases he treated the patient by the immediate application of plaster bandage, without subsequent confinement to bed, walking being permitted. He said his results were good, better than those obtained by the ordinary method, there was less atrophy, less stiffness of joint, that patients were able to resume their avocations sooner, and that the fracture healed more promptly.

This was in such direct opposition to the ordinary teaching that Dr. Martin thought it incredible, but he made up his mind to try it on a limited number of suitable cases,—*i.e.*, those of simple fracture seen early. From the early part of 1894—in the service of four hospitals, the University during the summer, the Philadelphia, St. Agnes's, and Howard Hospitals—he put such fractures in plaster of Paris, got the patients out of bed at once, instructed them first to walk about with crutches, then with crutch and cane, then with cane. In not a single instance had he had bad results, healing was prompt, so that instead of hospital patients they were ambulatory patients, reporting regularly for careful inspection of plaster bandage. Dr. Martin could not see that healing was more rapid or that there was any less atrophy than under the ordinary method of treatment. This claim remains to be proven. No doubt many surgeons have been in the habit of treating certain simple fractures—such as Pott's fractures—by a method similar to this. Dr. Martin disclaimed any novelty in the procedure, whatever is new in it consists in treating fractures of the femur, particularly complicated fractures for which Bardeleben and his followers make large claims. The principle of the treatment is extremely simple.

The displaced bones having been put in proper position are thus held by the plaster bandage. This bandage fits tightly at the knee, it covers in the leg, and is carried about the foot, the sole of which is thickly padded with cotton, so that it embraces all loosely from below

the malleoli. Thus when the plaster hardens and the foot is put to the ground the weight of the body bears not upon the broken bone, but upon the external column made of plaster. In these cases the plaster is reinforced sometimes by wood, sometimes by iron and wire, sometimes, in the case of fractured femur, by very elaborate apparatus. He had had no experience in the treatment of fracture of the femur in this way. It would seem extremely difficult to carry out. One useful purpose of this method of treating fractures of the leg is to call attention to the value of the plaster-of-Paris dressing. We have all seen fractures which have done badly under plaster of Paris; in Philadelphia it is not popular, probably because many of the badly-united fractures have been thus treated. Investigation would generally show that they were not properly watched, being usually cases occurring in the country where the physician could see his patient but once a week. Another objection urged against the plaster dressing is that it conceals the seat of fracture. Still another objection, and one of more weight, is that it is extremely difficult to apply properly,—that is, with sufficient firmness to hold the fragments accurately in place, and yet not so tight as to interfere with circulation. If it is applied with any amount of tension it has to be removed, and even when properly applied, subsequent swelling may make it too tight to allow free circulation. When the fracture has not been reduced properly the plastic dressing is particularly objectionable, since, though applied properly, it keeps up displacement. Now, if these objections are removed, Dr. Martin, personally, believes plaster of Paris by all odds to be the best dressing. When ether is given and extension made until the fracture is thoroughly reduced, plaster, applied properly and partially cut immediately below the knee, affords the very best means of dressing fractures. In case swelling does occur, it is a simple matter to remove the plaster. It may be taken off in five or six days and another put on without materially disturbing the fracture.

The objections offered to the dressing are intrinsically ill taken. Objections, however, founded upon the lack of rest, upon the impossibility of securing immobility,—Dr. Martin referred particularly to fractures of the femur,—founded upon the difficulty of properly supporting the parts so that the weight of the body is carried by the plaster and not the bones, these objections seem so well founded that that method of treatment can never become entirely popular in the treatment of complicated fractures or of even simple fracture of the

femur. Dr. Martin does believes that the majority of surgeons will treat simple fracture below the knee by reducing under ether perhaps more frequently than is now done, and by applying a plaster-of-Paris dressing, letting the patient be up and about in place of confining him to bed. Dr. Martin has thus treated altogether about twenty cases, and in none of these were the results unsatisfactory.

DR. L. S. PILCHER, upon invitation of the society, said that in the treatment of fractures of the lower extremity it is not merely because the ambulatory treatment of fractures is novel that it deserves attention. A more important question to consider is whether there is any reason why old and well-tried, apparently satisfactory methods in the treatment of any injury should be laid aside, and surgeons should put themselves into conditions of uncertainty, possibly of increased hazard, in the care of injured patients. It is very true, however, that if it is possible to lessen the amount of confinement that patients must be subjected to who have sustained injuries, or if a diminution in the amount of time that they are necessarily kept from their business can be secured, or if an increase in the opportunities for pleasure in life which they may have can be obtained, these constitute objects worthy of effort in the treatment of their injuries. Further, hospital surgeons have some responsibility in not unduly prolonging the time that these patients shall remain as charges to the hospitals in which they labor. It is for these reasons that the proposition to take those who have recent fractures of their lower extremities and so dress them that within a few days they shall walk out from the hospital, and shall be no longer charges to the institution, and shall in many instances be able to resume their vocations had appealed to his own interest. It is but recently that the possibility of doing this has been demonstrated. The history of this movement had been very clearly described by Dr. Edward Martin in the very interesting and pertinent remarks with which he had introduced the subject. The experience which Dr. Martin himself had had permitted him to speak with legitimate authority in the matter. Dr. Pilcher stated that he would give simply the experience in his own hospital service during one year. This peculiar method of the treatment of fracture was instituted by Dr. Pilcher's assistant, Dr. Warbasse, dating back two years from the present time. During the first year a number of patients had been so treated, and with eminent satisfaction. The results of the treatment were published by Dr. Warbasse in a paper in the *Brooklyn Medical Journal,*

an abstract of which was also published in the ANNALS OF SURGERY, together with an abstract of the papers of the German observers, which had already been referred to. During the second year, now elapsed, they had had under their care 21 fractures of the leg, classifiable as follows: simple fractures of the fibula only, 4; of the tibia, 3; of the tibia and fibula both, 6; compound fracture of the tibia and fibula, 6; compound fracture of the ankle, 2.

Three of the compound fractures required amputation; in other two, although the cases pursued an aseptic course, the local damage and loss of substance were such as to require careful treatment and confinement to bed for some weeks; in the remaining three cases, "walking casts" were applied at intervals of one, ten, and fourteen days, respectively, after the infliction of the injury. The following is a brief record of these cases:

CASE I. *Compound Fracture of Tibia and Fibula.*—Man, twenty-six years of age, had sustained a fracture of the tibia and fibula about five inches above the malleoli. An open wound communicated with the fracture of the tibia. The leg, after reduction and dressing, was put up on a Volkmann splint. On the ninth day a walking-cast was applied, and on the following day the patient was able to walk with the aid of a cane, and one week later he was discharged from the hospital.

CASE II. *Compound Fracture of Tibia and Fibula.*—Man, forty-two years of age, admitted with fracture of the fibula three inches above the malleolus, and a lacerated wound of the inner side of the ankle, through which the broken articular end of the tibia projected. Half of the articular surface of the tibia was broken off. The deformity was corrected, the wound sutured with drainage, and the leg put up on a Volkmann splint. At the end of two weeks the wound was perfectly healed, and the leg was put up in a walking-cast, with which the patient walked about with perfect comfort on the following day, and was discharged to return for further observation.

CASE III. *Compound Fracture of Tibia and Fibula.*—Man, forty years of age, admitted with a compound comminuted fracture of the tibia and fibula in the lower third of the leg, and fracture of the radius. The wounds were dressed, and a walking-cast was applied to the leg one and one-half hours after the injury. At the end of ten days the patient was discharged, to report for further observation.

Two of the simple fibula fractures, one of the tibia, and one of

both bones, were put up in the ordinary plaster bandage and discharged with crutches; the remaining fractures, nine in number, were all treated by the application of the "walking-cast" within a short time after admission, and sent home, except in the case of one man, thirty-three years of age, whose leg had been run over by a trolley-car, and suffered much contusion and comminuted fractures of tibia and fibula. Ten days after admission the leg was put up in plaster. This was removed at the end of twelve days, and a "walking-cast" applied.

This completes the history of the cases under treatment during the last twelve months. In simple fractures of the leg very few of them were kept in the hospital more than one or two days. Of the compound fractures—few they are, to be sure—some presented conditions notably difficult of management. The length of time that they were kept from their feet in the worst case was only one month. As regards the ultimate results of this method of treatment, they have been perfectly satisfactory. There are fractures and fractures, of course, and there is no method of treatment that will invariably produce the immediate desired result; sometimes there will be delays in union, naturally, and there will be tendencies to deformity in spite of every care in some cases. In the use of this particular method of treatment, the difficulties, which are inevitable in the care of fractures, in no way have been any more troublesome than with ordinary methods of treatment, while the ambulatory treatment had added all the advantages of being able to get about early, which had been enumerated.

There are two points, however, which should be matters of special watchfulness in carrying on this treatment: first, in the case of *oblique fractures*. Surgeons are in the habit of removing special appliances, in the case of leg fractures, at the end of six weeks or more and permitting the person to go about with simply a cane or other support as they may see fit, according to the strength of the limb. When a person has been lying in bed for this length of time without using his limb, it will be some time before he will regain full confidence in it so as to let his whole weight rest upon it. He will depend for a considerable length of time upon his cane or even upon his crutch, before he is willing to permit the weight of his body to be fully sustained by the injured limb. As the result of the progressive reparative processes the point of union will meanwhile become stronger and stronger, and at the end of the eight or ten weeks which elapse

before the patient does let his weight come fully upon it, it will have become fully consolidated and strong, and, as a rule, no consecutive increase in deformity takes place. But patients, who have been walking all the time with the injured part suspended in a plaster apparatus, never have lost their confidence, or they have regained it very soon, and when the surgeon takes off the special appliances and lets full weight come upon the injured limb, if ossification is not well advanced and the line of fracture has been oblique, there will be some danger of a gradual elongation of the uniting medium and some, possibly, even considerable, slipping of one fragment upon the other as a late occurrence, although at the time of the removal of bandage the fragments may have been in proper relation to each other. All surgeons who have to do with fractures have more or less experience with such late deformities occurring in cases which at the time of the removal of the appliances seemed in perfect condition. This is a misfortune which is more likely to occur in the ambulatory than in ordinary methods, and should be guarded against especially in case of oblique fractures.

The next point is this, in the ambulatory treatment the weight of the body is intended to be supported upon the expansions at the upper end of the tibia and at the lower end of the femur. The expansions about the knee are the surfaces which are to support the weight of the body. The apparatus is the medium of suspension. Whatever had been said by other speakers in praise of suspension as a method of treatment of fracture must meet the fullest acquiescence of every practical surgeon. The ambulatory method of treatment as carried out is simply a method of suspension, a most excellent method of suspension, the point from which suspension is made not being the frame-work over a bed or the ceiling, but the bony prominences of the limb above the seat of injury. Now it is possible that if the bandage is not smoothly applied, or if the inflammatory complications of the limb have been such as to seriously weaken the resisting power of the soft tissues, that the pressure here may cause ulceration. Of the cases reported by Dr. Pilcher he had been informed that one of them, after having gone out from his observation, some time later, finding that he was having some soreness and trouble about his leg, had drifted into another hospital, where, upon removal of the apparatus, some pressure-necrosis of the soft tissues in the leg was found to have occurred. The cases, then, should be kept under observation, and if symptoms of pressure-necrosis are present they should be uncovered.

In other words, they should be treated and looked after rationally, not simply turned off and considered as done with, but as still under treatment until consolidation has finally reached that point where they no longer need treatment.

As to the method of applying this suspension. It is an application of the method which surgeons are almost daily observing in the wearing of an artificial limb. In an artificial limb the weight does not come upon the end of the stump, but upon the tissues above; what is supplied to patients by the apparatus used in the ambulatory treatment of fractures is practically a hollow artificial leg. In the hollow of this artificial leg the injured portion is suspended, while it is at the same time surrounded by a soft and equable compression that tends to hold the parts together and secure their proper coaptation and promote their repair. This is further an expansion of the method of treatment of fractures by the plaster bandage. It is only those who have become expert in the use of the plaster bandage in the treatment of fractures that will be likely to resort to the ambulatory method in the treatment of leg fractures. The speaker then illustrated the application of the apparatus by a rough diagram drawn upon the black-board.

DR. ASHHURST said that the thing which had most forcibly impressed him, in listening to Dr. Pilcher's and Dr. Martin's remarks, was the fact that they seemed to speak of this mode of treatment as a novelty, and he thought that it was rather a sad commentary upon the short-lived character of fame that this subject could be discussed without any mention of Seutin, the Belgian surgeon, or even of Sir John Erichsen, of University College, London. Thirty years ago there was no text-book more popular with students, or more constantly referred to by surgeons, than the "Science and Art of Surgery" of Mr. Erichsen, who strongly advocated the treatment of fractures, even of the thigh, by the starched bandage, and declared that by its employment he was able to discharge patients with fractured femur, both children and adults, in three or four days from the time of their injury. The plaster-of-Paris bandage is, no doubt, better than the starched bandage, but the dressing is essentially the same. In the late Dr. Frank Hamilton's well-known work on fractures, the history of this mode of treatment is set forth, and followed by a most judicial summing up of the arguments for and against its adoption, and Dr. Hamilton's conclusion seems amply justified, that while valuable in the later, it is unsuited, except in rare instances,

for the early stages of fractures. It is one of those modes of practice which come up at intervals, are strenuously lauded and eagerly adopted by a few surgeons, and then relapse into desuetude until again revived to go through the same circle of experience as before. The suggestion to treat fractures as "walking cases" is certainly fascinating, and the plan presents the advantage of enabling the hospital surgeon to empty his beds promptly and use them again for others; but that this can be done with benefit to the patient has never been established. When Dr. Ashhurst first became familiar with Mr. Erichsen's views, he could not understand why a surgeon, usually so conservative, should, in his treatment of fractures, especially of the thigh, differ so widely from the majority of his professional brethren; but when he learned that Mr. Erichsen had comparatively very few beds at his disposal in University College Hospital, it was easy to see why a plan which permitted the patient to be discharged in a few days was more attractive to him than to the surgeons of, for instance, Guy's Hospital or St. Bartholomew's. There are special disadvantages in the use of the plaster bandage in cases of fractured thigh, and Dr. Pilcher has told us that he has not ventured to employ it in such cases, because there are much greater difficulties in the ambulatory treatment of fractures of the thigh than of those below the knee. Dr. Ashhurst has always taught, as an essential point in the treatment of fractures, that the proximal joints above and below should be immobilized, just as it is essential in the treatment of joint injuries that the adjoining bones should be fixed, and if he might be allowed to reply to Dr. Packard's remarks as to the fracture-box, he would say that with a fracture-box of the proper size, and properly applied, this indication can in the case of the leg be very well met. The plaster bandage, like the fracture-box, can be made to immobilize the knee and ankle, but not very well the hip, which can be better fixed by the long splint or sand-bag, in the horizontal position, than by any "ambulant" apparatus. The advantage of the fracture-box over the plaster bandage in fractures below the knee is, of course, that it permits frequent inspection and allows the prompt correction of any deformity that may occur.

Dr. Ashhurst was much interested in Dr. Pilcher's statements in regard to consecutive displacement after union of fracture. Where there is but one bone involved, as in the thigh or upper arm, this is more apt to occur than in other localities. Shortening of the humerus entails no great amount of disability or noticeable deformity,

but consecutive shortening of the thigh is of much greater consequence.

When Dr. Ashhurst was a resident physician in the Pennsylvania Hospital, a good many years ago, there was a patient with fractured femur treated by the long splint, the so-called Physick splint, as then used, who recovered promptly, and who, after six weeks, was found to have apparently a perfectly firm limb, with only half an inch shortening by measurement; the patient was allowed to get up and walk about with crutches for three or four days, when measurements were again taken, and it was found that the injured limb was about two and a half inches shorter than the other. In other words, consecutive shortening had occurred during these three or four days while he was walking about, amounting to two inches. The bones, though they seemed firmly united, had "telescoped" upon each other, and consecutive shortening resulted. The majority of fractures which he has seen, fractures of the leg as well as of the thigh, have not been serrated in the way Dr. Pilcher has represented in his diagram. Where there is a serrated fracture, we are all aware that the bones are readily kept in position. But fractures of the leg bones are usually oblique and often spiral, so that the fragments have not only a tendency to overlap, but one twists upon the other, and as a consequence it is extremely difficult to avoid rotatory displacement when union occurs; and although a plaster-of-Paris bandage which embraced both the knee and foot, might prevent this particular deformity, yet displacement will sometimes occur under even the most carefully applied fixed dressing.

He, too, is in the habit of using the ambulatory treatment in the later stages of fracture, when swelling has subsided, and particularly when there is a tendency to delayed union.

He has at present under observation a case in which the patient received in a railroad accident a fracture of the left humerus and of both tibia and fibula of the same side. The humerus united in the ordinary time, but the bones of the leg healed much more slowly. We often find this to be the case in multiple fractures, nature not seeming able to cope with all of the injuries simultaneously, and union being delayed in some of the broken bones if not in all.

The fracture in this case was an oblique one, and was carefully treated in a fracture-box, displacement being prevented by the proper adjustment of compresses. After about eight weeks, as union was not established, a plaster-of-Paris bandage was applied, and the

patient was allowed to get up, so that consolidation might be hastened, as it often is under these circumstances, by the physiological use of the limb. This object was secured, but while union occurred, the very deformity which had been so carefully guarded against in the fracture-box occurred also, inside of the plaster-of-Paris bandage. It was not such deformity as to interfere at all with the usefulness of the limb, but it was well marked; and such displacement would, of course, be even more apt to occur in a recent case than in one in which union had already begun. Therefore, while Dr. Ashhurst, in common with all surgeons, thinks the ambulatory mode of treatment valuable where union is fairly well advanced, it should, in his judgment, be employed in recent cases only exceptionally, and in fractures of the femur even more exceptionally than in those of other bones.

He is not disposed to think that the ambulatory treatment is likely to be adopted as a general mode of practice in fractures of the lower extremity, but believes that its present popularity with a few surgeons, both at home and abroad, is due to one of those waves of professional opinion by which it is brought into notice at intervals of fifteen or twenty years, and that, in due course, it will pass again as it has done before into a condition of comparative oblivion, doubtless to be brought up once more by some surgeon of the future after still another interval of time.

Dr. Frazier had observed the ambulatory treatment of fractures as carried out at the Charité Hospital in Berlin. In the wards of this hospital the late Professor Bardeleben demonstrated to the class, of which Dr. Frazier was a member, some of the cases then under the ambulatory treatment. These particular cases were fractures of the leg of two and three days' standing. The plaster bandage had been applied immediately on admission to the hospital. In the application of the bandage Professor Bardeleben laid particular stress on one point,—namely, that the foot be strongly flexed, thus requiring the patient to walk on his heel always. For the purpose of demonstration to the class, Professor Bardeleben got the patients out of bed, made them walk up and down the ward, first with the aid of crutches, then with a cane only, and lastly without any support. This the patients did without suffering any pain. Professor Bardeleben had treated successfully, during the past year, fifty-eight cases by the ambulatory method. The advantages of this method, both for the injured limb itself and the general condition of the patient, he claims are equally great. After the removal of the bandage the adjacent joints are freely

movable. Muscular atrophy, delirium, and other complications are not met with. The time required to perfect a cure is shorter. These, he claims, are strong points in favor of this mode of treating fractures.

Dr. John H. Packard said he had been much interested in Dr. Pilcher's account of the ambulatory treatment of fractures of the leg. The number of cases adduced is rather too small to serve as a basis for appreciating its results.

From his study of anatomy, and especially of artistic anatomy, Dr. Packard thought that there are few subjects in whom the shape of the limb just below the knee would give a sufficient purchase to the supporting apparatus. In old men with very large joints, and but little subcutaneous fat, such support might be readily had. But in many people in whom the shape of the limb would appear to be tapering at that point, it is really the soft parts that constitute the form, and they would be apt to suffer from the pressure.

He attempted to put the idea of ambulatory treatment in practice by getting his patients up on crutches as early as possible with safety. This, with lateral splints or the zinc strip, or with the plaster dressing, can very readily be done. Of course, it is not possible with the fracture-box. At the end of three or four weeks, the limb having been swung in walking, the patient may be encouraged to make a little use of it, still, however, resting his weight mainly on the crutches. Thus the limb gradually comes to take the place of the crutches. But it really makes very little difference if the crutches are retained for some time after they are not absolutely needed.

Dr. J. Ewing Mears fully agreed with Dr. Pilcher's statements in regard to getting the patients out of hospitals as soon as possible to save expense, but he could not agree with him that under this method of treatment patients could be in all cases returned much more promptly to their vocations. For instance, have any records been kept, in connection with the treatment of the patients the reports of whose cases were read by Dr. Pilcher, with regard to the time at which they had returned to their business. A patient going out of the hospital with such a dressing as Dr. Pilcher had illustrated, if he was a hod-carrier he could not carry bricks up a ladder, if a postman he could not travel about the city and deliver letters, if a gentleman in commercial life he might go to his office, perhaps, and transact business with slight difficulty, but, to take a rather exaggerated view, if he was a dancing-master he could not follow very promptly his busi-

ness. It is important for us to know how much time is saved by the ambulatory treatment of fractures. It is not necessary to say that the tendencies of modern surgical methods are decidedly in the direction of shortening treatment, of terminating the length of treatment both in regard to operative procedures and with regard to the treatment of fractures. It is always the effort, it is believed, of every surgeon who has a case of fracture under his care to get his patient out of bed as soon as possible, as soon as it is safe for him to get out, and when the time has arrived to change the form of dressing to the ambulatory in order that he may set up and walk about on crutches.

The very important point for us to consider in the adoption of this plan of treatment is, do we gain as much as we possibly may lose? Dr. Pilcher alluded to one case especially where serious conditions followed the application of the dressing and the removal of the patient from under the care of the surgeon, and he also referred to the shortening which is liable to occur. It seems that if these conditions do occur, we do not gain so very much by turning our patients out too soon and removing them from observation. As is well known, there is no class of injuries in which the surgeon is more liable to prosecution for malpractice than fractures, and the surgeon assumes a good deal of responsibility who will turn his patient out from under his immediate care before the reparative process is completed. He fully agreed with Dr. Pilcher that it is desirable to get patients out of bed, but at the same time the question should be very seriously considered as to what is the proper length of time and what may be accomplished by the method of treatment under discussion.

Dr. John B. Roberts said he had only had one case of fracture, that of the fibula, which he had treated by the ambulatory method. The method was employed with great satisfaction. He thinks Dr. Ashhurst does not feel as he does about the ambulatory method, because they look at the question from entirely different stand-points. Dr. Roberts does not regard the present mode as identical with that proposed many years ago. The splint is of the same material, it is true; but the leg is suspended now in a sort of artificial leg with a large amount of padding under the sole of the foot. This was not the principle of the older method, which was simply a means of making a rigid encasing splint. He likes the present method, and believes it will become a permanently-used method of treatment, at least in fractures below the knee.

Dr. T. S. K. Morton said he had no experience with the Bar-

deleben method, but he was familiar with the literature. For years he had treated his cases by getting patients out of bed almost at once, plus massage, washings, and frictions. He gets all ordinary cases out of bed within twenty-four hours. By this system less atrophy and stiffness results. Then, again, there is another benefit in hanging the limb in a somewhat dependent position. Statements have been recorded tending to show that the venous engorgement about a fracture hastens union. If these prove true, then ambulatory treatment has another point in its favor. Whether ambulatory treatment will do away with frictions, massage, passive motions, whether it will be of sufficient value to displace these, he questions somewhat.

Dr. Edward Martin stated that he thought the feeling of most of those who spoke on this topic of the ambulatory treatment is not that the getting of the patient out of bed is novel at all. We might go back further than Erichsen and Hamilton, for no claim had been made by the speakers of the evening that ambulancy after fractures of the leg was new, but that the particular method in use at the present time was new. He made no claim that the ambulatory treatment is applicable to every fracture. It is applicable in certain cases. It teaches the lesson that the plaster bandage is the best treatment for fractures of the lower extremity, and permits many patients to attend to their business, perhaps not those subject to hard manual labor, who would otherwise be confined to bed for four or five weeks.

Dr. Pilcher, in summing up, disclaimed being made to appear as a partisan of this particular method of treatment. He was not there as a partisan, but simply for the purpose of discussing the possibilities of this proposed method of treatment and presenting the results obtained under his own observations quite recently. Dr. Martin's reply to Dr. Ashhurst's criticism as to the lack of novelty is complete and needs no addition. The use of starch or plaster bandage is certainly not new. Neither Dr. Martin nor he had intended to suggest that it was. In reference to the special serrated fracture drawn upon the board by Dr. Pilcher, which Dr. Ashhurst had alluded to, this special line of the fracture was not of any importance, and its introduction into the diagram had been accidental. It is no better to treat a serrated fracture than an oblique fracture, or a spiral fracture, or a comminuted fracture by the ambulatory method. The more comminuted it is the better it would be to have such an appliance, which by the constant traction of the weight of the part below the fracture would tend to overcome muscular spasm.

As to the criticism of Dr. Packard as to the frequent lack of bony prominence at the knee, not every knee certainly would be as suitable for the application of this kind of suspensory apparatus as would the knee drawn on the black-board. There are undoubtedly many cases which will occur in which it would not be a practicable method of treatment. The most he would say was that it has merit in proper cases, and as to what a proper case will be would doubtless be a matter of difference to different men. Some will use the method more freely, some will be more successful, some will obtain better results through its use than others. It will largely depend upon the carefulness with which one attends to the precautions in its use, so that it is like every other surgical procedure, in some degree good or bad according to the operator.

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, October 7, 1895.

The President, THOMAS G. MORTON, M.D., in the Chair.

GASTRO-ENTEROSTOMY—MURPHY'S BUTTON RETAINED IN THE STOMACH SIXTEEN MONTHS.

DR. OSCAR H. ALLIS reported the following case: The patient, a man forty-five years of age, was admitted to the Presbyterian Hospital in March, 1895, in a condition of extreme emaciation, with well-defined tumor in the epigastrium and the usual symptoms of pyloric obstruction due to carcinoma of the stomach. March 3, Dr. Allis made an anastomosis between the stomach and a loop of small intestine, using a Murphy button for the purpose. The patient bore the operation well, and passed from observation, until one year and five months later. During this interval he had regained sufficient strength to return to light work.

In August, 1895, his vomiting returned, and he was readmitted to the hospital. Upon opening the abdomen the carcinoma was found to have greatly increased; the walls of the stomach were friable and in tearing away some adhesions they gave way. From the condition of the patient and the extent of disease it was evident that recovery was out of the question. The wound was accordingly packed with gauze. He did not rally, but died during the following night.

At the autopsy, pus with general peritonitis was found in the abdomen, evidently the result of perforation. The symptom vomiting was due to this. The button was found in the stomach. The entire stomach, save a small area at the cardiac orifice, was involved in the carcinomatous degeneration.

DR. THOMAS S. K. MORTON remarked that the accident in Dr. Allis's case illustrated one of the great obstacles to success in the operation of gastro-enterostomy,—the dropping of the button into the cavity of the stomach. It has been suggested, and he believed that

the suggestion had been carried out, that the opening be made in the posterior aspect of the stomach, on the assumption that the posture of the patient, while lying upon his back, would favor the dropping of the button backward into the bowel. The button should be made of steel for these operations upon the stomach, so as to avoid the poisoning which might occur from its long retention, in case it were made of brass. This button demonstrated the absence of acid from the secretions of the stomach in a case of carcinoma of this organ, since it showed no evidence of corrosion after more than a year's stay in the stomach. The retention of the button in the intestinal tract is one of the disagreeable occurrences that tend to limit the usefulness of Murphy's invention.

DR. JAMES M. BARTON said that in the case reported by Allis he was his assistant at the operation. The obstructive vomiting was strongly marked and unmistakable, but at the operation the cancer was found not to be in the pylorus, but close to it, and the obstruction was caused, not by the cancer filling the pyloric orifice, but by the very extensive puckering caused by the contraction of the cancer, one of the folds of mucous membrane lying over and very successfully obstructing the pylorus.

This would throw some light upon the unexpected permanency of the cure of non-malignant pyloric stenosis by digital divulsion. In a letter from Treves, he states there has been no return of the symptoms in a case operated on by him six years ago. Dr. Barton had had similar good fortune in a case on which he operated about the same time, and Loreta and others have reported many successes. In two of the three cases on which he had operated the sensation of a band giving way was most marked.

If the obstruction in these cases is due to puckering caused by a healed ulcer and the obstructing band is torn, it is not at all unlikely that when the torn band heals the resulting fold may not be obstructive. In the case observed, a very slight change of position or of tension in the band would have permitted the pylorus to be unobstructed.

EXPLORATORY LAPAROTOMY IN A CASE OF HIGH-LYING CARCINOMA OF RECTUM.

DR. ALLIS related the facts in the case of a woman, aged forty-eight years, high up in whose rectum he had detected by digital examination a malignant growth. For the purpose of ascertaining

more positively its intrapelvic relations, with a view to its possible removal, he made an incision through the abdominal wall in the left inguinal region, and introduced his hand for exploration. The growth was found to be firmly attached to the sacrum, and its complete removal impossible. A portion of the sigmoid flexure was sutured to the parietes in readiness for future colostomy, should fæcal obstruction occur, and the wound closed.

The patient died three months later, but no obstruction of the bowel occurred.

Dr. Allis remarked that the exploration through the abdominal wall was a great help in mapping out the true condition of the rectum. Had he been obliged to decide upon an operation by rectal and superficial abdominal exploration alone, it is probable that an attempt to remove it would have been made through the sacrum, and if not with immediately fatal results, certainly with no possible benefit. In carcinoma of the rectum that can be fully explored no preliminary abdominal incision would be required, but where exploration is unsatisfactory, and the prognosis impossible from want of data, then the abdominal exploratory incision is not simply justifiable, it is humane, and in the true sense conservative.

OPERATIVE TREATMENT OF AGGRAVATED EQUINO-VARUS.

Dr. T. S. K. Morton presented a boy, eighteen years of age, who had been operated upon nine weeks before for a very bad equino-varus of both feet, division of the tendons proved sufficient in the right foot, but in the left excision of the astragalus and the scaphoid proved necessary. It was the most hopeless-looking foot he had ever seen. It seemed almost impossible to restore the parts to a normal position. Nothing else would have produced this result but a very extensive bone excision. The operation was done by making a long external incision backward from the metatarso-phalangeal joint of the little toe to a point just beyond and below the external malleolus. This wound was closed by loose suturing without drainage. The position of the foot was corrected by repeated dressings subsequently. A good joint had been obtained between the os calcis and the tibia and fibula. The wound was soundly healing, and he walked upon the sole. The appearance of the foot will continue to improve as the years go on.

In all these operations done by Dr. Thomas G. Morton and himself at the Orthopædic Hospital, making a total of about fifty operations, there had been no suppuration and no loss of tissue by sloughing. And in no foot in all this series had there been failure to get very much better position than it had before the operation. There had been freer motion after the operation of excision between the bones of the leg and the tarsus than normally exists; but this does not interfere with locomotion.

DR. THOMAS G. MORTON added that in the removal of the astragalus for inveterate club-foot, general tenotomy is always required, as well as section of all the flexor toe tendons, also the removal of any portion of the tarsus, or section of soft parts, which in any way obstruct the restoration of the foot to a normal position without tension. This has been the practice at the Orthopædic Hospital for many years, and the results have been most successful, the case exhibited being in nowise an unusual one, except in the excessive deformity of which it was the subject.

Stated Meeting, November 4, 1895.

DEFORMITY FOLLOWING GUNSHOT WOUND OF THE LOWER JAW.

DR. J. EWING MEARS exhibited a patient with "gunshot wound of the lower jaw involving the cavity of the mouth." The patient was a man thirty-six years of age, who, at the time of the injury, was a fireman on a passenger train which was passing through the Indian Territory. A short distance from a station the train was signalled, and, as it did not stop, a volley was fired into the cab by robbers. The only person injured was the patient, who was struck on the right side of the face by a ball from a Winchester rifle, the ball passing through the jaw into the cavity of the mouth, taking away a part of the tongue, and removing all of the teeth of the lower jaw except three on the left side, coming out through the lower lip, destroying a great portion of it. He recovered, but with great deformity, hav-

ing lost the greater portion of the lower lip and of the anterior portion of the chin, some of the bone having been removed by the ball. Owing to the inflammatory condition which followed, the tongue was fastened to the floor of the mouth. The injury was received in September, 1893, and six months afterwards the railroad company sent him to New York, where efforts were made to bring the two fragments together. This operation, owing to the pressure made upon the larynx was not completed, but the tongue was partially released. He was in New York for two months, and came under Dr. Mears's care the last of August, 1895. The saliva was constantly pouring out of his mouth, owing largely to the absence of the buccal space on the right side. The operative treatment was in two stages. It was desired first to secure a buccal space, and then to reform the lip, after which it was intended to have an artificial denture made which would fill in the space caused by the loss of bone. Ligatures were placed between the fragments of the jaw and the cheek, and in that way the tissues were gradually divided ; three ligatures were used altogether. A flap was then turned up and brought into the space between the portions of the lip remaining, so as to quite fill it up, and it has now nearly a continuous border. The triangular opening which was formed was closed by pins and sutures. Union took place normally. In order to enlarge the buccal space incisions were made inside of the mouth from the left side around to the ramus on the right side, cutting loose the tissues clear to the alveolar border, and the wound was packed with a 5-per-cent. iodoform gauze. There is now a space which is certainly three-quarters of an inch in depth, in which an artificial denture may be placed. Saliva does not now escape from the mouth. An artificial denture, temporary in character, will be placed in the buccal space for some time. Already the mucous membrane has covered the raw surface on one side. He cannot at present project the tongue, as it still requires further loosening.

Dr. Thomas S. K. Morton said that he had a somewhat similar case within a short time in a young man who, eight years previously, was firing a fowling-piece, when it exploded and tore open the left side of his face, including both lips and cheek up to the zygomatic process. The entire buccal cavity was laid open upon that side, making a huge wound. This finally healed, leaving his lips some half inch apart at the left outer angle. An enormous cicatrix bound the two jaws together like an iron strap, his mandible remaining fixed in firm contact with the upper maxilla for several years ; he having

been nourished during that time on fluids, never having seen his tongue, nor been able to take solid food. The cicatrix was extensive, binding the entire left lateral portions of the upper and lower jaws together. The reporter determined to excise the left outer angle of the mouth, where the lips were wide apart; to attempt to remove the cicatrix from the jaws; to pry them open if possible, and then to unite the lips in a more presentable shape. All of this was accomplished, but the amount and density of the cicatricial tissue was almost incredible. The jaws were forced open with pliers to the extent of one and a quarter inches; the great mass of cicatricial tissue was cut away from its attachment to the bones, while that portion involving the lips and angle of the mouth was dissected out. This permitted accurate suturing of the freshened lips. At the end of three or four days the sutures were removed and another attempt was made to separate the jaws with the pliers. This proved successful in getting the jaws apart, but the wound partially separated out on the cheek. Fortunately, the lips did not separate where united. Quite a hole, perhaps half an inch in diameter, opened into the mouth, but subsequently closed by granulation.

His physician, two months after operation, reported that he was easily able to maintain the movement and full separation of the jaw by daily use of his pliers, and could partake of solid food. The wound had united firmly and his personal appearance had been much improved.

Dr. J. Ewing Mears said that this case of Dr. Morton's belonged to a class of cases in which occlusion of the jaws occurs as the result of cicatricial tissue. He had had a number of these cases, one of the most interesting being in a woman, thirty-two years of age, living in Texas, who came to him with the jaws firmly closed, the closure having taken place when she was eight years of age. It was the result of cicatricial contraction following ptyalism. The lower jaw was not of any greater size than that of a little child of eight years of age. There was great projection of the upper jaw, which was largely developed. He emphasized this point because he had found in other cases, where there had been a bony ankylosis, that after operation the use of the jaw very much facilitates the development of the tissues of the face. One case, who was not able before the operation to grow any beard, after the operation grew and now wears a very heavy one. He had learned from some experience in cases of occlusion due to cicatricial contraction that simply to

divide this cicatricial tissue and to force open the mouth by means of wedges or levers generally resulted in failure. His plan was to introduce ligatures behind the cicatricial tissue and to allow them to remain loosely between the integument and the cicatricial tissue for a time, in order that the mucous membrane may be formed in this channel. The principle is the same which is observed in dividing web-fingers.

LIGATURE OF THE SPERMATIC CORD FOR CONDITIONS OTHER THAN HYPERTROPHY OF THE PROSTATE GLAND.

DR. J. EWING MEARS presented specimens from dogs upon which the operation of ligature of the spermatic cord had been performed, and remarked as follows:

At the meeting of the Academy in November, 1894, I read a brief paper on "Ligature of the Spermatic Cord in the Treatment of Hypertrophy of the Prostate Gland," in which this operation was advocated as a substitute for that of castration, which had in a number of instances been performed, but which it was thought would not receive general sanction by reason of the objections entertained by patients to the removal of the testes, to the mental and moral condition provoked by the operation, and the legal questions which might arise. The operation in itself was not regarded as entirely free from danger, although it did not involve the section of large tissue surfaces. Since the reading of this paper, I have taken occasion to perform the operation of ligature of the spermatic cord in dogs in order to determine (1) the conditions accompanying the operation; (2) the preferable method of operation; (3) the effect produced by the operation upon the testes and prostate gland. Three dogs of full growth—in apparent good health with the testes fully developed—of the setter and spaniel breed were selected, and the cord ligatured in the following manner:

In the first the cord on each side was exposed by an incision and an aseptic silk ligature was applied, the ends cut off, and the wound closed by interrupted sutures of aseptic silk and sealed by collodion and iodoform gauze.

In the second animal an attempt was made to ligature the cord subcutaneously. Owing to the absence of the proper needle the effort was a failure, and the ligatures could not be firmly applied to

the cord. It was hoped, however, at the time of the operation sufficient pressure had been exerted to occlude the artery.

In the third animal on one side the cord was exposed, a double ligature applied, and the cord severed between. On the other side the cord was exposed and tied with a single ligature. The material used in the operation on this animal, ligatures and sutures, was made of hemp, which had been immersed in a carbolic solution. The closure and treatment of the wound were the same as in the first instance.

As to the conditions accompanying the operation, the care of the animals after the operation, owing to circumstances beyond control, was of such a character as to make it not possible to decide whether the conditions which supervened in the first and second, suppuration at the site of the ligature, were the result of defective treatment or of the mutilation of tissue incidental to the operative procedure. The stitch abscesses were undoubtedly caused by the efforts of the animals to dislodge the sutures. In the third animal the wound healed without suppuration. The inflammation which occurred in the first and second animal was not of a severe character, and did not, as reported by the attendant, make any marked impression upon the health of the animals.

As a result of the conditions which appeared after the operations, it is difficult to make affirmation as to the preferable method of applying the ligature, unless it would be to the effect that the open method provided conditions most favorable to primary union. This method not only insures inclusion by the ligature of the entire cord, but it affords means for drainage in the event of the occurrence of suppuration.

The specimens taken from the animals at the expiration of seven weeks from the time of operation were presented for examination. In those removed from the first and third animals there are present marked evidences of atrophic changes in the testes and prostate glands. Reduction of the testes to what may be fairly stated to be one-third the normal size, with evident reduction in the size of the prostate gland, has taken place. Microscopic examination of sections which had not been very well made showed that the changes which had occurred in the testes were those of disintegration, due undoubtedly to the absence of proper nutrition. Some changes in the structure of the prostate gland were also observed, but not sufficiently marked were they to establish their character.

If from such limited observations conclusions can be drawn, it

might be proper to affirm that (1) ligature of the spermatic cord will produce atrophic changes in the testes and prostate gland. There is reason to believe from the observations made that the changes which occur are sufficient to obliterate the functions of these organs, consisting as they do undoubtedly in structural disintegration. The vascular supply interfered with by the ligature of the cord is that which gives nutrition to the secreting elements of the testes. Sufficient blood-supply it is believed is derived from other sources, and is distributed in such manner to the testicular coverings as will prevent gangrene of the organ.

(2) The effect on the prostate gland produced by ligature of the cord is shown to be the same as that produced by castration,—that is, atrophic changes. Castration undoubtedly destroys functional activity of the prostate gland, and is accomplished through the well-established anatomical and physiologic relations of the two organs. Structural disintegration through which the function of the testes is entirely obliterated will accomplish the same result, and this can be produced by ligature of the spermatic cord.

Ligature of the cord is an operation to be preferred to castration, for these reasons: (1) If any distinction can be made as to danger it should be in favor of the former. (2) The mental and moral effect produced by the removal of the testes would in most cases be very marked; the mere suggestion of the operation would be sufficient in many cases to elicit a refusal. The proposition to perform an operation similar in character to that for the relief of varicocele with the statement always that obliteration of the function of the testes is expected to result, it is believed would be more readily entertained.

Believing the operation of ligature of the cord to be devoid of danger and effective in destroying the function of the testes, I suggest its performance as a curative remedy in a class of patients which finds its home in the public institutions of the commonwealth devoted to the care of the feeble-minded, the idiot, the pervert. I think it is the experience of those having charge of institutions of this character that perversion of the sexual function is largely responsible for the mental and moral condition of a very large class of inmates, and that curative measures are of little avail so long as the function remains. Castration has, from time to time, I think, been suggested, but has never been practised, owing to the difficulty of obtaining the consent of parents and guardians, on one hand, and the refusal, on the other, of the physician to assume the responsibility of performing an

operation not sanctioned by public opinion or authorized by legislative enactment. To obtain the consent of parents or guardians to the performance of an operation which involves such palpable mutilation as removal of the testes would always be difficult, if not impossible, whether they might belong to an ignorant or cultivated class of people. It would be still more difficult to obtain authority under legislative enactment, since in such matters law-makers would be prone to regard the opinion of the public, and up to this point it is safe to say public opinion is not educated.

It would be different, it seems to me, with regard to the operation of ligature of the cord. In this operation, mutilation, as understood by parents or guardians, is absent,—the atrophic changes which occur progress slowly—reduction in the size of the organs is gradual, —if within the power of the patient to appreciate it, the mental and moral effect would be slight. In the performance of an operation of this character for curative effects, under such regulations as the authorities of institutions might provide and enforce, would legislative sanction be required? Cannot the same liberty of action be granted the conscientious surgeon in the performance of this operation as in that which involves the removal of the healthy ovaries in the female for relief of conditions which menace her health and endanger, possibly, her life? As is well known, the operation of oöphorectomy has not only been advocated, but practised in females suffering from certain forms of insanity with a view to obtain curative effects. Why not apply the same rule of practice in the case of the male, and especially, it seems to me, it is proper to do so, when in the male relief may be afforded by an operation of very much less magnitude than that requisite in the female.

Dr. W. W. Keen asked if Dr. Mears had any means of determining the original size of the two prostates which are apparently atrophied. [The result of the experiment on the testes certainly appears to have resulted in very considerable atrophy of both, on comparing the testes of the normal dog with the other two, but he could not see very much diminution in the size of the prostate gland. He thought surgeons had a very sure foundation for the belief that castration will do a great deal in most cases of hypertrophy of the prostate, but whether the atrophy of the testicles, resulting from ligature of the spermatic cord, will be followed later by decided shrinkage of the prostate, is a thing we cannot judge of at present. A few days previously he had operated in a case of enlarged prostate with

about five to six ounces of residual urine in the case of a man past seventy, but had not yet been able to observe any marked improvement.

DR. MEARS thought that we had already sufficient experience with this subject to decide one or two points very positively. If the testicles are removed, in cases of pure hypertrophy of the prostate gland, the operation will be curative. It will reduce the size of the prostate materially. It will set up changes in its structure which will reduce it in size. When we can, by an operation which is less in gravity than that of castration and which is not opposed by the objections which patients very properly urge against the latter, accomplish all that can be obtained by castration, it seemed to him that we should make the effort. If by ligature of the spermatic cord we can obliterate the function of the testes, we affect the function of the prostate gland. If by ligature of the spermatic cord we can produce atrophic changes in the testes, he thought we could do the same in the gland, owing to the anatomical and physiologic relations existing between the two organs. His efforts had been directed simply to the substitution of one operation for another, believing that that which is most desirable to accomplish—the relief of patients who are suffering from the horrible conditions which attend hypertrophy of the prostate gland—can be secured by the simpler operation. With regard to the question that he ventured to suggest, the performance of this operation for conditions other than hypertrophy of the prostate gland, he thought it to be a very important one. Since the presentation of his paper, one year since, he had had letters from different persons, and some had called upon him. They all expressed in very strong terms the necessity of some curative means to relieve the conditions which exist in the institutions referred to. His object had been to bring the matter before the profession for consideration.

CASTRATION FOR PROSTATIC ENLARGEMENT.

DR. THOMAS S. K. MORTON said that he was able to add one case of successful result following castration for prostatic hypertrophy. The patient, aged seventy-one years, was admitted to the Pennsylvania Hospital, August 25, 1895. There was given a history of increasing difficulty in micturition, extending over a considerable time and culminating in total retention. Attempts by a physician to relieve the bladder failed of their purpose, but originated alarming hæmorrhage. Subsequently he was removed to the hospital. Upon admission it was found that the man was still bleeding and had a dangerously distended bladder.

Ordinary instruments failed to pass the prostate, but finally a vertebrated catheter of large size gained admission and drew off the urine. Then it was proved by rectal examination that an enormously hypertrophied prostate existed. It was as large as an orange and exceedingly soft in consistency. The urine was black with decomposed blood, ammoniacal, and contained much pus and detritus. Hæmorrhage ceased after catheterization, but recurred upon each subsequent introduction of the instrument. The difficulties attending the withdrawal of urine constantly increased until it became apparent that operative interference must be resorted to or the man would speedily perish. It was decided, if consent could be obtained, to perform castration, and, if this failed, to do a cystotomy later. The experimental nature of the proposed operation having been explained, written consent of the patient and some of his relatives was secured. The testicles were removed on August 28. Although catheterization had to be continued, blood ceased almost immediately after operation, and the urine began to clear up and become less decomposed. On August 30, the urine had become entirely clear of blood, pus, and odor; and two days later was and has since continued to be normal. On the second day after operation he began to pass a portion of his urine. This amount steadily increased until a week later the catheter was discontinued and there was no residual urine. Examination of the prostate by rectum at this time demonstrated its reduction in size to that of a hen's egg, and in consistency to that of the normal gland. Following this he passed through a period of partial incontinence, which was ascribed to weakened sphincteric action. But this slowly improved, so that in three weeks from the time of operation the action of the bladder was normal.

On October 29 he was in excellent health and could not sufficiently express the extent of relief that the castration had afforded him. He urinated from four to six times a day, had no distress whatever, and passed normal urine. The prostate was much smaller than when examined two weeks after operation, and had become very dense in structure as well as perfectly insensitive.

Owing to the patient repeatedly removing the dressings, both wounds suppurated, but no harm resulted.

FIBRO-ANGIOMA OF QUADRICEPS EXTENSOR CRURIS.

Dr. John B. Roberts presented a specimen of a fibro-angiomatous growth of the quadriceps extensor cruris muscle, with critical remarks upon such tumors. (See page 431.)

CASE OF RECOVERY FROM EXTENSIVE COMPOUND FRACTURE OF THE SKULL, WITH WOUND OF THE SUPERIOR LONGITUDINAL SINUS AND LOSS OF BRAIN-SUBSTANCE.

DR. W. W. KEEN presented a man whom he had seen first in May, 1893, twenty-two hours after he had been injured by the falling of a heavy wheel from a height of thirty feet, striking directly upon the top of his head. Much blood, and, as reported, nearly half an ounce of brain tissue had been lost immediately after the accident. When seen by Dr. Keen he was perfectly conscious and had neither paresis nor paralysis of any part of his body. Just an inch and a half to the right of the middle line was a linear wound three inches long, the anterior end of which somewhat overlapped the fissure of Rolando.

After suitable incisions to expose the parts, the bones were disclosed in fragments and driven into the brain to a depth of nearly two inches. The two largest fragments extended from the fracture towards the middle line, and were bent downward at the sagittal suture as on a hinge. A pair of hæmostatic forceps were all that was necessary to remove nine fragments of bone, leaving an opening of three by two inches. When the largest fragments implicating the sagittal suture were removed, two rents were discovered in the superior longitudinal sinus, one large and one small. The large one was seized with two hæmostatic forceps, which controlled the hæmorrhage, which was profuse. The small one was stopped by packing with iodoform gauze. The dura, at the seat of fracture, was completely torn through and the edges could not be approximated. The gap was filled with pulpy brain substance and blood, in which were found later several small fragments of bone which were carefully sought for and removed. Nearly a tablespoonful of brain tissue was unavoidably lost in the manipulation necessary for extracting the bone and checking the hæmorrhage. A linear fracture also was found extending towards the ear.

The wound was again disinfected with care and then sutured, excepting at the middle half where the forceps, which had been placed on the sinus, were left in place surrounded with iodoform gauze (which made a ball of nearly an inch and a half in diameter) prevented such suture. The entire wound and the forceps were covered with sublimate gauze, and the patient put to bed in very good condition, in spite of the large amount of blood lost.

Two days later, he still was perfectly conscious and without any evidence of paralysis of any kind. The wound was exposed and the forceps and gauze removed with but little loss of blood, and the entire wound was sutured rather closely, to prevent a probable fungus cerebri. The surface of the wound showed evidence of a beginning fungus cerebri, and the manipulation incident to the dressing caused the loss of half an ounce more of cerebral tissue. Some of it, which was evidently pulpified blood and brain tissue, was intentionally removed.

Under the care of his physician, Dr. North, he made a speedy and uninterrupted recovery without any fungus cerebri. Several small sinuses remained unhealed and discharged considerable pus. At no time was there any paralysis of either motion or sensation.

On the fourth day his temperature rose to 104.6° F., but steadily fell and reached the normal at the end of a week.

At the end of five weeks he had a slight epileptic attack, It began at 4.45 A.M., with slight convulsive movements of left side of the chest. This gradually extended up into the left shoulder and down the arm, then the entire arm shook up and down, the movement being chiefly in the upper arm and elbow rather than the hand and wrist. This lasted about a minute and then gradually diminished, when the same twitching movement began in the left hip, extending down the leg to the foot. The nurse describes the character of the twitching by saying that when the hip was grasped it could not be steadied. The head was drawn towards the right side. He did not lose consciousness, and when asked to put out his tongue did so without trouble. The attack lasted until twenty minutes of six.

At 9.20 A.M., shortly after his head was dressed, he had a similar attack, lasting four minutes. He did not lose consciousness and had no pain and no discomfort except the twitching. He was perfectly comfortable during the day and had no increased headache. The wound was still discharging, partly a thin watery discharge and some pus. There was no loss of power in the left arm after the attack, but he complained that his leg was tired. His eyesight has not been good since the accident. Over a week before he had made an attempt to write a letter, but after writing one word complained that he saw double. Sight was weakest in the right eye. Both pupils were much dilated.

In September, 1893, he entered the Orthopædic Hospital. At

the middle of the left border of the swelling, at a point in the median line, were three openings which discharged a small amount of pus. The probe revealed dead bone in each of the three. That at the posterior portion was loose. At the anterior and middle openings the bone was still firm. The anterior and posterior part of the scar was united by first intention. In the middle there was a large bulging tumor, the size of a medium-sized orange, along which ran, in the middle line, the old scar. This had been broadened to about an inch in width, and the greater part of it was ulcerated and discharging slightly. The large tumor was soft and in part fluctuating. His mental condition was fair, although his memory was sometimes at fault.

From the posterior opening, by making a small incision, a sequestrum was removed, two and a half inches long and one-third of an inch wide at its widest part. A large part of it consisted of the inner table only. It corresponded to the sagittal suture, and showed on its inner surface the grooves for the longitudinal and the lateral sinuses near their junction at the torcular Herophili. Through the operation wound escaped a considerable amount of cerebro-spinal fluid, reducing somewhat the size of the tumor, but through the opening the major part of the tumor was seen to consist of a subcutaneous fungus cerebri. The wound was approximated by close sutures, excepting at one point for drainage, the object being to obtain speedy union and prevent an external fungus cerebri. He made a speedy convalescence.

At the present time, November, 1895, he remains perfectly well without any further epileptic attacks.

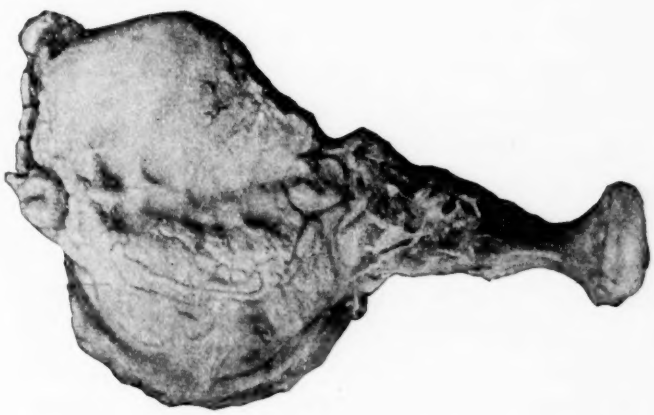
Over the site of the bony defect, which is four and a half inches long and two and a half inches wide, the scalp is wrinkled and very flabby, but he does not suffer from headache or other cerebral disturbance, though still unable to do any work.

Dr. Keen said that this was the worst and most extensive compound fracture of the skull that he had ever had occasion to operate on; all other cases of equally extensive fractures being moribund at the time when he first saw them. It was of extreme surgical interest to him to observe, first, the relative ease with which he was able to control the bleeding from the superior longitudinal sinus; secondly, the lesions being in the occipital region and to the right side, it was of interest to notice that there was hemianopsia, the left side of the field of vision being blind and the right side with normal vision;

thirdly, the very extensive necrosis of the bone after the operation necessitated a second operation for its removal; and the fact that this necrosed portion of bone was so much more extensive on the inner than the outer table of the bone, and also that the large fragment removed shows the groove for both the superior longitudinal and the lateral sinuses, approaching the torcular Herophili; fourthly, the absence of any paresis of the leg in spite of the extensive loss of brain-substance (over two ounces) in the region for the leg-centre.

EXCISION OF LOWER JAW FOR SARCOMA.

Dr. Thomas S. K. Morton presented a specimen of about three-fourths of the inferior maxilla, which he had removed from a colored man, aged twenty-one years. The disease had existed for eighteen months, and had started in the socket of a diseased tooth on the left



side of the jaw,—probably the first molar. A superficial operation had been performed by another surgeon soon after the vegetative process manifested itself. Now, at the end of eighteen months, the growth had attained the size of a small orange and had ulcerated upon the inner or mucous membrane surface. The incisor and bicuspid teeth on the diseased side of the jaw were distorted to a right angle with their fellows.

The customary operation was performed, not dividing the lip, and all of the jaw removed from the first molar on the right side to and including the condyle upon the left. Preliminary ligation of the

facial artery and of the inferior dental, when reached, as it entered the infradental canal largely prevented hæmorrhage. It was found that the tongue was not infiltrated. All suspicious mucous membrane was dissected away, and then the mucous margins of the wound were accurately sutured, thus cutting off all raw surfaces from communication with the mouth. The skin wound was then separately stitched, leaving a little acetanilide gauze packing running from the posterior angle of the incision up into the cavity of the former temporo-maxillary articulation. No shock resulted, and the patient reacted well.

The sutured mucous membrane held tight for two days before leaking. Then partial infection took place. Prompt and satisfactory recovery, however, ensued, and he was able to return to his home in another state in four weeks.

Microscopical examination demonstrated the growth to be a large spindle-celled sarcoma.

REVIEWS OF BOOKS.

LECTURES ON APPENDICITIS AND NOTES ON OTHER SUBJECTS. By ROBERT T. MORRIS, A.M., M.D., etc. New York: G. P. Putnam's Sons, 1895.

This collection of lectures includes the substance of the author's teaching on the subject of appendicitis at the Post-Graduate Medical School in New York City, added to which are a series of notes upon other subjects, many of which have received little attention at the hands of writers upon surgical subjects, although the notes themselves have appeared in one form or another in various periodicals of this country before appearing in their present collected form.

The methods followed by the author in preparing the patient and surgeon and his assistants preliminary to the operative procedure are those almost universally in vogue among surgeons at the present day. In speaking of iodoform gauze, he makes the objection to its use that the fixing agents used in its manufacture interfere seriously with its capillarity, and hence the mechanical action of the gauze, which is its chief value, is destroyed. For this reason he has abandoned its use in his clinic.

In discussing the relative merits of iodoform and aristol, he extols the latter because (1) it adheres to tissues much more tenaciously than iodoform; (2) it rarely produces toxic effects; (3) its odor is to be preferred; and (4) it quickly forms with lymph a thin protecting coagulum, which is almost impenetrable to bacteria. The somewhat fanciful proposition is advanced that, in the presence of the free iodine which is given off, irritating ptomaines are destroyed, and leucocytes "marshal their forces on one side of the coagulum wall, while bacteria are making slow progress from the other side." The aristol is not absorbed readily, but becomes encapsulated in the tissues.

There can be no two opinions among those who strive to reach idealism in aseptic work as to the truth of Dr. Morris's assertion that every surgeon must attend personally to the preparation of his catgut. He employs chromic gut altogether, and preliminary to the chromicizing process he follows his own method of preparing the catgut by first immersing in plain sulphuric ether for a week, then in a 1 : 4000 solution of mercuric chloride in sulphuric ether for another week, and, finally, in a fifteen-grain-to-the-pint solution of bichromate of potassium in alcohol for fifteen hours. It is finally placed in absolute alcohol for storage.

In support of the efficiency of his methods of asepsis and antisepsis he gives a list of 193 operations upon 178 patients, with but a single death. It is interesting to note in regard to this list that it contains sixty-seven abdominal sections, many of which were performed under conditions of meagre advantages, including a transformed dwelling-house as a hospital building, scant and often no preliminary treatment, and being generally left to the care of the medical attendant for after-treatment. He modestly disclaims any particular skill on his own part in this reduction of a general surgical death-rate to a fraction of 1 per cent. under such circumstances.

In the chapter upon appendicitis we find the subject admirably well treated from the clinical stand-point. Interesting are the notes in regard to the relation of temperature to the special kind of infection at hand in individual cases. As a portion of the therapeutic argument from the stand-point of the surgeon, a typical case of appendicitis is carried through a course of medical treatment, and following this a case treated surgically is detailed. The contrast as depicted by Dr. Morris is startlingly dramatic.

Under "Surgical Treatment," the author gives the technique of his inch-and-a-half incision procedure. While probably an incision of this length in the peritoneum, or even less, will suffice for the removal of an appendix essentially normal, at the hands of an experienced and skilful operator, yet an attempt to follow this rule, under circumstances of diseased conditions of the organ, will, in the judgment of most surgeons, be frequently followed by disaster to the patient.

A list of appendicitis cases is given, beginning with the first case operated upon by Dr. Morris, and ending with the one hundredth. Fifty-nine of these cases were without infection, excepting in the immediate vicinity of the appendix; there were no deaths in this class. Seven of the list were cases of peritoneal tuberculosis involving the appendix, in six the disease apparently having its origin in the latter. This experience in tuberculosis of the appendix must be regarded as exceptional. All of these cases recovered from the operation. In three recovery took place from the peritoneal tuberculosis, and in one the latter persisted. A case of malignant disease involving the appendix and cæcum is reported. No recurrence had taken place fourteen months after the operation.

In the author's experience, an exceptionally large proportion of cases of general septic peritonitis complicating appendicitis recovered. Where this complication is present with no adhesions or loose flakes of lymph and pus he simply flushes out the whole peritoneal cavity with large quantities of physiological salt solution at a temperature of 100° F., inserted through a long tube of large calibre. In the presence of the last-named complications the adhesions are first broken up by inserting the hand, after which one or two pints of hydrogen dioxide solution are injected. Following this the abdomen is washed out with the physiological salt solution. He deprecates the use of gauze packing in the abdominal cavity in these cases. Nevertheless, the method has many advocates among experienced and successful operators. The author advocates placing a small drainage wick in the lower part of the abdominal or pelvic cavity, asserting that the opposed peritoneal planes must exert capillary power at any distance and draw free fluid from all directions towards the point at which the greatest power is being constantly exerted. While general tamponnade of the peritoneal cavity with gauze is open to many objections, the method of carrying bundles of wicking in several different directions radiating from the external opening would seem to be a rational procedure.

On the other hand, a study of the twenty-three cases in which

walled-off abscesses existed without general infection of the peritoneal cavity presents some interesting features. It is in this class of cases that the surgeon is generally impelled to give a favorable prognosis. Two of these cases died from septic peritonitis as a post-operative complication. Of the other three, one died of acute suppurative nephritis which existed before the operation. A second died of intestinal obstruction, the result of adhesions which could not be separated on account of the patient's condition, although the operation was undoubtedly undertaken for the relief of the obstruction. The appendix was not actively inflamed in this case, its mucous membrane being almost entirely preserved, nearly the entire length of the ileum, however, had slipped through an old band of adhesion, which extended from the tip of the appendix to the mesocolon. A third was a case in which a perforated gangrenous appendix was found. It is only fair to state that the first two mentioned fatal cases of walled-off abscess which died from post-operative septic peritonitis were the first cases of appendicitis occurring in the author's experience in the operative treatment of appendicitis.

Included among the notes upon other subjects are articles of interest. Among these are to be particularly mentioned "Gall-Stone Solvents," "Digestive Ferments in Surgery," "Conservative Surgery of the Arm," "Skin-Grafting from Blisters," and "Ovarian Transplantation."

The many useful and fine illustrations which appear in the book are the work of Dr. Henry Macdonald. The entire mechanical make-up of the work is a type of the highest order of book-making, and reflects credit upon the press from which it is issued.

GEORGE R. FOWLER.

L'OPÉRATION DU TRÉPAN. Par FÉLIX TERRIER ET M. PÉRAIRE. Two hundred and twenty-two illustrations. 12mo, 283 pages. Paris: Félix Alcan, editor, 1896.

This little volume upon the operation of trephining reminds the reader of the similar monograph by John Fletcher Horne, M.D.,

which was published about a year ago, but differs from that work in several important particulars. The greater part of the material which has served in the production of the present work was collected by Professor Terrier for use in his lectures in the Medical Faculty of Paris in the year 1894; these lectures have been somewhat elaborated and are now published. The book makes no pretensions to merit as a literary production, but contains a vast mass of facts stated in a clear, logical, and concise manner.

The work is divided into four parts. Part I. is devoted to the consideration of the operation of trephining as it was performed by the prehistoric races, by the Arabians, and by the more learned surgeons down to the beginning of the present century. Examination of ancient skulls has revealed the fact that, although in many cases portions of the skull were removed after death to form into amulets, yet there are other instances in which the brain of the living subject was exposed by means of an operation, and recovery occurred. The numerous illustrations of skulls, and of stone, bronze, and iron instruments used by these early operators are especially interesting to a student of the early history of medicine. It is to be noted that even as late as the sixteenth century the methods in vogue appear to be about as barbarous as those used by the untaught medicine men in the neolithic age.

"In order to know where the trephine should be applied, the study of the cerebral convolutions, and of cerebral localization, especially of the motor centres, is absolutely necessary. It is, moreover, indispensable that the relation of these fissures and gyri to the external surface of the skull should be accurately determined." These important topics are dealt with in the second part of the book. The historical sequence of discovery is preserved by personal mention, in connection with each centre described, of those French, German, English, and American surgeons who, after the appearance in 1863 of Broca's memorable article upon the subfrontal gyre in primates, applied and amplified the principles therein contained, to other portions of the brain.

In the latter half of the chapter details are given of the various plans which have been devised to locate the projection of the principal sulci of the brain upon the ectal surface of the skull. The determination of the exact position of the Sylvian and central fissures is, of course, of prime importance; to this the author gives the most attention, but the location of the lesser fissures of the middle meningeal artery and of the motor centres are not neglected.

The last 100 pages are, from the point of view of the practical surgeon, the most important in the book. The different forms of trepans, trephines, chisels, rotary saws, elevators, and other instruments comprising the armamentarium needed for the various steps of the operation are concisely described, and their use explained in the text and by illustrations. Preparation of the patient, mensuration of the skull, marking out the lines of operation, anæsthesia, scalp incisions, and control of hæmorrhage prepare the way for the description of the actual opening of the skull itself. Examination of the meninges and of the brain, with subsequent drainage and dressings, are next considered, and the remainder of the chapter is devoted to the means by which loss of cranial substance is repaired, and the reimplantation of bone is done.

The indications and contra-indications for trephining are presented in a tabular form and constitute the fourth and last part of the work.

H. P. DE FOREST.

CORRESPONDENCE.

A SIMPLE AND RELIABLE MEANS OF BLADDER-DRAINAGE.

In reference to the article by Dr. Keen in your issue for February, entitled, "An Improved Apparatus for Drainage by Siphonage in Operations on the Bladder," I would say that for more than four years past I have taught and demonstrated this method to my classes at the New York Polyclinic as being the best. I have, however, made no claim to originality, as the principle is a well-known one, and has been long used by dentists everywhere, to keep the mouth free from saliva during dental operations.

Since, however, the device I use is considerably simpler than that of Dr. Keen and equally efficient, I have thought that you may care to have it figured here.

Its parts are, an ordinary fountain-syringe, and a length of small rubber tubing, to reach from the syringe to the bladder. Nothing more is needed; and in ten minutes' time, at a cost of practically nothing, the drainage may be at work.

The accompanying sketch perhaps hardly needs explanation.

A is the catch which always is sold as a part of a fountain-syringe. It is so applied, in this case, to the *side* of the tube, as to permit the flow to be almost or quite drop by drop. One may regulate to a nicety the desired frequency of bladder-siphonage by the speed of this flow.

B is the beginning of a length of rubber tubing of any desired number of feet, passing into the wound, and ending at the bottom of the bladder. (A safety-pin holds it in place, to the dressings.)

Its calibre should be smaller than that of the syringe-tube.

The joint is made by cutting away a small piece from the side of the syringe-tube, and sewing the end of other tube (B) to fit this

opening. Rubber-cement (made by dissolving rubber-tissue in chloroform) makes the joint tight; and it is further strengthened by wrapping with strips of rubber adhesive plaster.

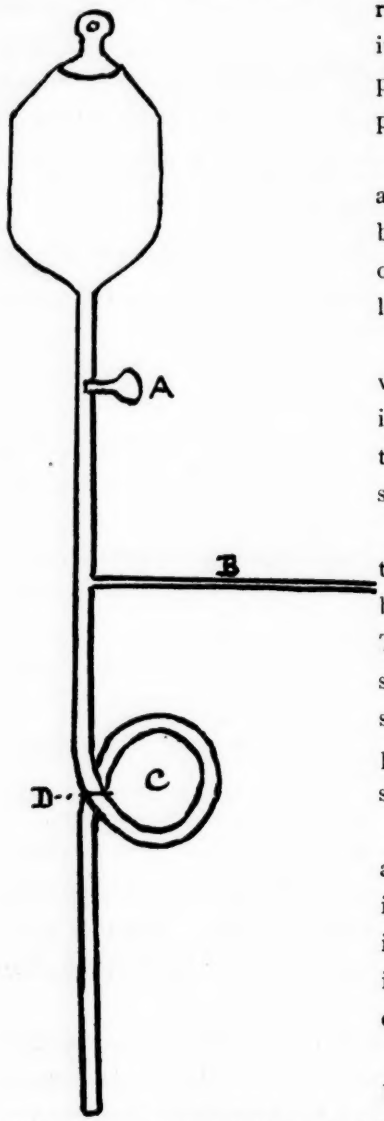
Of course, if the surgeon has a glass or metal T-tube, this may be used here to advantage instead of the joint just described. The latter will do, however.

C is the most simple and convenient shape of siphon-trap. It is held in place by an ordinary elastic band, D, snapped around the syringe-tube at this point.

When in use, the water slowly trickles down until the trap, C, becomes filled to over-flowing. Thereupon a swift siphonage results, until C is empty, when the same thing repeats itself. The principle is that of intermittent siphonage.

During the act of siphonage, a partial vacuum is thereby formed in the smaller tube, B, which ends in the bladder. Therefore B, in its turn, is made a siphon, and it empties the bladder.

This action we may regulate by means of the catch, A, so that it will take place once in each minute, or ten minutes, or as often as may be desired.



Dawbarn's simple and reliable means of bladder-drainage.

Very Respectfully,

ROBERT H. M. DAWBARN.

THE REDUCTION OF DISLOCATION OF THE HUMERUS COMPLICATED BY FRACTURE AT THE ANATOMICAL NECK; OPERATIVE TREATMENT OF SEPARATION OF THE LOWER EPIPHYSIS OF THE FEMUR.[1]

By CHARLES McBURNEY, M.D.,

OF NEW YORK,

SURGEON TO THE ROOSEVELT HOSPITAL.

TWO years ago, in January, 1894, I read, before the New York Surgical Society, a paper under the title, "Dislocation of the Humerus complicated by Fracture at or near the Surgical Neck, with a New Method of Reduction."[2]

In this paper I referred to the rarity of this complicated injury, and reported a case of my own which had been successfully treated by an original method.

At that time surgical literature furnished the records of only 117 cases, my own being the one hundred and eighteenth. In 70 of these 118 cases the fracture took place at the surgical neck; in 27 at the anatomical neck; in 11 cases the fracture was described as having occurred at the "neck"; in 6 cases both anatomical and surgical necks were fractured; in one case the fracture was said to be comminuted; and in 3 the "upper part" of the humerus was the location given for the fracture.

It is probable that the number of cases of dislocation with fracture at the *surgical* neck would be largely increased if all the cases had been reported in which fracture occurred during attempts at reduction of the dislocation. This accident may hap-

[1] Read before the New York Surgical Society, January 22, 1896.

[2] Published in the ANNALS OF SURGERY, April, 1894.

pen even in the hands of the most careful surgeon, and it is in precisely this set of cases that the reputation of the surgeon is most concerned in his effort to repair the now complicated injury.

The chief diagnostic features are the presence of the head of the bone in an unnatural position, and its failure to move when free rotation of the arm is made.

Of course, the lower down the fracture occurs the easier will be the diagnosis, but in any case examined with the aid of an anæsthetic, before union between the fragments shall have occurred, the diagnosis should not be difficult. After such union has occurred the diagnosis of the character of the injury may be very difficult or impossible.

In my former paper I referred to the methods of treatment which had been previously adopted, and which may be summarized as follows:

(1) Reduction of the dislocation by manipulation of the head and subsequent treatment of the fracture. Of eighty cases in which this method was adopted, in thirty-six success was attained, and in forty-four all efforts failed.

(2) Treatment of the fracture until union has occurred and then secondary later attempt at reduction. This method has been for some time rejected by modern surgeons as having but little to recommend it, the history of the cases in which it has been used being very unsatisfactory.

(3) Riberi's plan of attempting, by passive movements made from the time of diagnosis, to establish a neärthrosis between the lower and upper fragments.

This plan had been made use of in seven cases with very imperfect final results.

(4) Open arthrotomy with the view of forcing the reduction of the head of the bone followed by treatment of the fracture. Among the 117 cases reported in January, 1894, open operation was practised upon six patients. In every such instance the head of the bone was either primarily or secondarily removed.

The very unsuccessful treatment of this injury, as shown by the reports of all cases in which reduction of the head by manip-

ulation had failed, led the reader to devise the method which was fully described in the former paper, together with its successful application in a case in which dislocation of the head of the humerus was complicated by fracture obliquely through the surgical neck.

The method was based upon a full recognition of the fact that the difficulty of reduction consists in the feeble control, which the operator is able to obtain, of the small upper fragment, which is so buried beneath heavy muscles that only very weak manipulations can be practised. To obtain suitable control of the head of the bone an instrument was devised, being a short right-angled steel hook with a powerful handle. The plan suggested was the drilling, after incision, of a hole into the upper fragment, the insertion of the short hook, and the application of traction in the suitable direction. In the case reported complete success was attained at the first attempt, and the final restoration of the function of the limb was absolute.

This method was devised especially to suit the cases in which fracture took place at or near the surgical neck, and, while I believed that its applicability had a wide range, I had had, when I presented the plan to this society, no opportunity to test its efficacy in a case of dislocation complicated by fracture, in which the fracture took place at the anatomical neck. In this rare injury the small size of the upper fragment would naturally render simple manipulations much more ineffectual than when the fracture took place at a lower point, and I was somewhat fearful that an attempt to apply my method to such a case might meet with unexpected difficulties.

I feared especially that in order to apply the instrument it would be necessary to make an undesirably large exposure of the joint, and also that, after the head had been drilled and the hook inserted, sufficient force could not be exerted to accomplish reduction of the head without tearing away the cancellous structure beneath the articular surface. I therefore wish to report the following recent case which shows that my fears were unfounded in fact, and that the method is applicable to cases of dislocation complicated by fracture at the anatomical neck, as

well as to those in which the fracture takes place at a much lower point.

H. M. D., twenty-eight years of age, was brought to me by my friend, Dr. Thomas S. Robertson, with the following history: Three weeks before, while sitting in a barber's chair, he was seized with a fit of unconsciousness, fell from the chair and injured the right shoulder. The right upper arm was immediately disabled and great swelling and discoloration rapidly appeared. The patient was visited by a surgeon, was etherized, and the diagnosis of subcoracoid dislocation was made. Attempts at reduction of the dislocation met with no success, and the arm and shoulder were bandaged and immobilized. The patient continued to suffer great pain and complete disability. I first saw him, in consultation with Dr. Robertson, on November 6, 1895. The right shoulder was slightly swollen, very sensitive to pressure, and all motions caused great pain. The right upper arm lay close to the thorax, and the forearm supported by the other hand was bent at a right angle. The head of the bone lay just beneath the coracoid process, and the glenoid cavity was entirely empty. Gentle rotation of the humerus caused a corresponding amount of rotation of the head of the bone, and the diagnosis of subcoracoid dislocation was made. On the following day ether was administered, and a gentle attempt at reduction by Kocher's method begun. Before outward rotation of the humerus had been half completed, marked crepitus was felt, and the effort at reduction was stopped. Further examination then revealed very plainly that fracture at the anatomical neck complicated the dislocation. The shaft of the humerus could be felt to rotate and to include in its motions the whole of the greater tuberosity. At the same time the head of the bone could be grasped with the fingers of one hand, while rotation of the humerus was made with the other. Very marked crepitus which increased under manipulations was clearly produced between the head of the bone and the extreme upper end of the shaft.

These facts were clearly demonstrated to Dr. T. S. Robertson, Dr. E. F. Arnold, and Dr. Douglas Ewell. Every effort short of operation was now made to accomplish reduction of the dislocation, but without success. I was not prepared at the time to do an open operation, nor did I care to undertake such without every preliminary precaution. I was entirely satisfied that before I saw the patient partial union between the fragments had occurred sufficient to render

correct diagnosis, at the first examination without anæsthetic, impossible.

On November 10, the patient took a room at the Roosevelt Hospital, and after careful preparation the operation was done on the same day, in the presence of Drs. Robertson and Arnold, and the members of my house staff. Ether was given and again prolonged efforts by manipulation were made to effect reduction. Not the slightest change in the position of the head of the bone could be made. The diagnosis was very clearly confirmed during these manipulations.

A straight incision was made from the tip of the acromion downward for three and a half inches through the anterior portion of the deltoid muscle to the bone throughout.

Separation of the soft parts with retractors revealed first the line of fracture. It ran accurately through the anatomical neck, excepting that the lower limit of the fracture was a trifle below the neck. By rotation of the humerus the fracture could be readily and widely opened, and the evidences of former partial union were clear.

The head of the bone lay deeply embedded in the subcoracoid position. A slight extension of the deep incision upward and inward allowed the outer portion of the head to be seen. The drill was applied at a point about one-quarter of an inch from the edge of the fracture, so passing first through the articular surface.

The hook was then inserted, and while the humerus was held away from the body, traction was made on the head outward and forward. I feared to apply great force lest the cancellous tissue of the head should give way, and at the first attempt only succeeded in lifting the head a short distance. The second attempt resulted in a similar manner. At the third effort I used more power and could feel the head of the bone rise more than an inch from its abnormal position. At the same time one of my assistants pushed vigorously with the fingers on the head of the bone and towards the glenoid cavity, and reduction was effected with entire success. The fragments were now sutured together with catgut, the fractured surfaces meeting very accurately. The wound in the soft parts and in the skin was closed with catgut and a drainage-tube inserted at the upper and lower ends of the wound. Sterile dressings were applied, and the whole shoulder and arm and midthorax were enveloped in plaster of Paris.

On November 14 the tubes were removed and the wound was found to be aseptic. The temperature and pulse remained normal.

On November 20 the dressing was changed and the wound found to be in a perfect condition.

On November 23, two weeks from the day of operation, the patient was allowed to leave the hospital and go to his own apartments. Slight passive movements were begun at the beginning of the fifth week and were continued and increased almost daily up to December 31, seven weeks and two days after operation, when the patient returned to his home in Tennessee. At that time motion at the joint was perfectly smooth in character. The right hand could completely grasp the left shoulder. The right forearm could be actively passed behind the back till the upper arm touched the thorax.

The right hand could be actively passed behind the head, and the right arm could be elevated to a right angle with the body. Passive motions to a greater extent could be made with some pain, which was rapidly diminishing.

A report received from the patient yesterday states that there is good movement in the joint in all positions, and that the strength of the limb has returned fully excepting when the arm is at a right angle with the body or higher.

The restoration of function has certainly been exceptionally rapid and complete.

It is hardly necessary for me to add that the method employed in this case is not to be recommended excepting in cases in which all proper and harmless methods to reduce by manipulation have been faithfully tried and have failed.

Cases of Separation of the Lower Epiphysis of the Femur.

I wish to report the following two cases because the subject of traumatic separation of the lower epiphysis of the femur, if we exclude the compound injuries, is one with which few can be practically very familiar, for the cases are rare.

Hamilton mentions a half dozen cases, the reports of which he collected, but he had seen only one of them, and that one was already three years old.

A recent paper, by Dr. Richard H. Harte, of Philadelphia,

which was published in the last volume of the Transactions of the American Surgical Association, gives many facts of interest in connection with the subject. To the surgeon familiar with traumatic cases, there can be no great difficulty, when an anæsthetic is employed in arriving at a correct diagnosis. While the appearance of the limb is somewhat similar to that in which dislocation at the knee has occurred, the location of the false point of motion should define the differential diagnosis. More difficult is it to decide as to whether the separation is one purely through the conjugal cartilage or whether a very low fracture of the femur has taken place. In the latter instance, rough, bony crepitus should determine the existence of true fracture in cases where reduction can be made.

The two cases which I report possessed some precisely similar characters. In the first place the deformity was exactly the same in both cases, and in both cases reduction by simple manipulation was impossible.

Case I.—David M., nine years of age, came under my care at the Roosevelt Hospital on November 16, 1895. The boy had fallen from a height, striking upon the feet, and had injured the left limb near the knee. My house-surgeon received the case and recognized a displacement of the external condyle forward with fracture. Extension seemed to reduce the displacement and Volkmann's posterior splint was applied. Subsequently a change of dressings was made and the displacement was noted to still exist. Pain and swelling continued, and, finally, the case was brought to my attention on the twentieth day after the injury. A considerable anterior displacement of the leg forward at or about the knee-joint was noted. Externally at the extreme lower end of shaft of the left femur a sharp, angular projection of bone could be felt. This was clearly continuous with the shaft. Anterior to this, lifting the soft parts over the point of the femur and practically continuous with the leg, was a considerably firm tumor. Holding the tumor with one hand and the femur with the other, false motion could be made between the two without crepitus. Motion of the tibia—that is, flexion and extension—was normal in quality and took place between the tumor and tibia. The diagnosis of separation of the lower epiphysis of the femur was deemed probable, and with the aid of anæsthesia attempts at reduction were made.

Extension in the straight and flexed positions, over-extension with pressure from above upon the epiphysis and lateral angular motions were all made without success. Partial reduction without crepitus was accomplished, but redisplacement immediately took place. I then made an incision about five inches long, beginning on the outer side of the limb just below the projecting angle of the lower end of the shaft. The incision passed vertically upward. The soft parts were divided down to the bone and the lower end of the shaft was exposed. It was quite bare, the periosteum having been stripped up from its face for several inches. Lifting the soft parts still more freely the whole lower end of the diaphysis could be seen and the characteristic appearance when separation through a conjugal cartilage has taken place was plainly recognized. The epiphysis could now be lifted on the fingers. A superior, somewhat excavated, quite smooth surface could be felt across its whole width. The epiphysis lay quite anterior to the lower end of the diaphysis, markedly to the inner side, thus accounting for the angular projection of bone externally, which I have already mentioned. Even now I had difficulty in making reduction, and only succeeded when powerful extension was practised, and at the same time with the aid of a periosteal elevator, the posterior lip of the epiphysis was pushed over the anterior edge of the shaft.

After the reduction no difficulty existed in maintaining the epiphysis in place when the leg was partially flexed. Full extension reproduced the deformity. Partial flexion was therefore maintained, the wound closed, and the limb put up in plaster of Paris. No fever or other interruption to wound healing has occurred and the position remains good.

CASE II.—Thomas B., five years of age, received an injury to the region of the right knee, having been run over by a vehicle on December 16, 1895. He was brought to the Roosevelt Hospital on the same day. The knee was swollen, very tender to touch, and the leg partly flexed. No voluntary movement of extension could be made. The general appearance of the limb was such as would be produced by an anterior dislocation of the leg. Externally, and just above the position of the external condyle, was a prominent angular point of bone which was continuous with the shaft. In front of this and somewhat to the inner side was a movable tumor evidently consisting of the articular end of the femur. This could be moved laterally without crepitus. On this tumor the leg could be partly

flexed and extended. The ligamentum patellæ was markedly tense. Efforts at reduction of the displacement, similar to those made use of in the preceding case, were carefully made. That is to say, extension in the straight and flexed positions, over-extension with pressure from above upon the epiphysis and lateral angular movements with extension and pressure were all carefully practised and all failed. Operation, precisely similar to that done in the first case, was then at once performed and reduction was readily accomplished. After reduction only soft, cartilaginous crepitus could be produced by motion of the lower upon the upper fragment. The wound was then closed with catgut stitches and rubber-tissue drainage, and the limb was immobilized in a slightly flexed position by means of plaster of Paris. Wound-healing has been entirely perfect, and took place under the primary dressing. The position and the general condition of the limb is most satisfactory.

April 1, 1896, both of the patients referred to above have now been present for inspection at the Surgical Society meetings. In the younger of the two the result was perfect in every particular. In the other case, which first came under observation twenty days after the injury, a minute necrosis of skin and bone at the extreme outer angle of the diaphysis took place. In other respects the result is perfect, excepting that voluntary flexion at present is limited just after the right angle is passed.

ON ACUTE PRIMARY OSTEOMYELITIS OF THE VERTEBRÆ.

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ACUTE infective osteomyelitis of the bones of the vertebral column is a disease rarely met with, and beyond this, when it occurs, it is often only recognized in the post-mortem room. As we will hope to show in the succeeding pages, the disease is, perhaps, not quite so uncommon as has been assumed, while the additional material we have to offer may render its future recognition somewhat more easy. Our own material comprises eight cases, with post-mortem records, of which two have been already published,[1] while the recent papers by Hahn[2] and Müller[3] furnish us with two additional original cases together with a collection of eleven others which had previously been recorded. Thus, collectively, we have twenty-one cases on which to work, and from which to attempt to build up the principal clinical features of the affection, features dependent not in any inherent special character of osteomyelitis of these bones, but solely on its special localization in the trunk, its great depth from the surface and proximity to the spinal cord and membranes.

[1] R. C. Lucas, Lancet, 1889, Vol. I, p. 883; C. A. Ballance, Lancet, 1884, Vol. I, p. 888.

[2] Ueber die primäre akute Osteomyelitis der Wirbel., Beiträge zur klinische Chirurgie, Band XIV, Heft 1, p. 261, 1895.

[3] Ueber akute Osteomyelitis der Wirbelsäule, Deutsche Zeitschrift für Chirurgie, Band XLI, Heft 6, p. 445, 1895.

We shall proceed, now, to describe these eight cases, to which we have added one of a practically analogous nature affecting the supra-occipital bone, especially interesting from a diagnostic point of view.

CASE I.—*Posterior Arch of Atlas.* C. R., male, aged seven years. Had been ailing for fourteen days, complaining chiefly of headache. A swelling at the nape of the neck had been noticed for four days before admission. There was no history of accident.

On Admission.—Fourteenth day. The boy looked extremely ill, with a flushed face, high temperature, and harassing cough, without marked physical signs in the chest. There was a fluctuating swelling the size of a walnut at the junction of the hairy scalp with the skin of the neck. This swelling was surrounded by a brawny, inflamed area, and was assumed to be due to pediculi, with which the hair was full. The cervical glands were not enlarged.

Seventeenth day. The neck had been poulticed with relief of the pain and improvement in the general condition.

Eighteenth day. Signs of consolidation were noted at the right base, and the evening temperature was again very high.

Twenty-first day. The abscess in the neck was incised and two ounces of pus evacuated.

Twenty-fourth day. Condition continued unsatisfactory, and although there was no apparent cause in the state of the wound or lungs the temperature remained high. A swelling appeared over the right great trochanter and much headache was complained of.

Twenty-fifth day. The dressings were found saturated with a watery discharge, and clear fluid issued from the drainage-tube in an intermittent flow, synchronous with the pulse. This fluid on analysis contained both albumen and chlorides.

Twenty-sixth day. The general condition had changed for the worse, and he had one slight fit affecting trunk and limbs. Profuse watery discharge from the wound continued.

Twenty-seventh day. Diarrhœa and sickness had increased for several days. Undoubted fluctuation now present over the great trochanter.

Twenty-eighth day. He became delirious, and lay curled up in bed picking at the bedclothes and with marked signs of irritation. Some rigidity of the right arm was noted before death, which occurred on the evening of this day.

The posterior arch of the atlas lay white and bare at the bottom of the abscess cavity, its two halves being separated by a median vertical fissure. An opening in the dura mater, the size of a crow-quill, connected the subdural space with the abscess cavity just above the centre of the arch of the atlas.

The spinal meninges were thickened and congested, and on laying open the dura mater a large quantity of turbid fluid escaped, while the cord was coated in part with flakes of lymph, and the vessels of the pia mater were much congested.

Inside the skull there was basal meningitis, and the choroid plexuses were covered with lymph. Pus had collected in the posterior cornua of the lateral ventricles. There was an abscess over the right great trochanter and three abscesses in the right lung, which was deeply congested, but not pneumonic. No other secondary deposits were found.

Remarks.—In this case a definite local abscess was present even on admission, but in spite of this a diagnosis was not made until the escape of cerebro-spinal fluid showed too late the true nature of the case.

The strictly median position of the abscess and the absence of immediate improvement on opening it were against its being one in the occipital glands due to pediculi.

The absence of liquidity was probably due to the comparatively superficial position of the abscess and the non-involvement of the spinal centra and articulations.

The symptoms of cerebral meningitis developed comparatively late, though it is possible that an examination of the eyes would have given earlier warning. The spinal meningitis apparently caused no symptoms.

It is obvious that early resection of the atlas arch by removing the original focus of disease and giving free drainage might in a similar case prevent the direct involvement of the meninges and secondary abscess elsewhere.

CASE II.—*Odontoid Process of Axis.* H. K., male, aged six years. On coming home from school four days before admission pain was complained of in the neck and the head held stiffly. This pain and stiffness had much increased, keeping the boy awake all night. There was no knowledge of any injury.

On Admission.—Fourth day. The boy stood erect with his arms pressed against his sides, the spine was rigid, and the head and neck moved only with the other parts of the body. Slight pressure on the vertex or any attempt at rotation of the head caused acute pain. When placed in the supine position he could not rise without first turning over onto his knees and then supporting the head with both hands. There was fulness and marked tenderness on either side of median line in upper part of neck, over which the skin was hot. No tenderness over the cervical spines, nor swelling in the pharynx.

Fifth day. He gained most ease by sitting with his head between his knees, or by lying in the prone position with his head hanging over the side of the bed supported by his hands.

Eighth day. The swelling of the neck had decidedly increased.

Tenth day. The whole neck was now swollen and œdematous, while the points first noted were hard. Incisions were made through the brawny tissue on each side of the neck down to the transverse processes of the atlas. No pus was found, but much serum escaped and gave relief.

Eleventh day. The neck had nearly assumed its normal size, but the general condition had not improved.

Twelfth day. Pain and effusion into left elbow were noted.

Fourteenth day. General condition had changed much for the worse. Pressure-sores had developed over internal malleoli and heels, also subcutaneous abscesses below each nipple, over spine of right scapula, in lumbo-sacral region, right axilla, and over occiput. The last was incised, but no bare bone found.

Fifteenth day. Became unconscious and died. Temperature had been continuously high throughout, with only slight morning remissions and without rigors. There were no convulsions.

The capsules of both occipito-atlantal joints were distended, and thin fetid pus escaped on incision. The synovial membranes of these joints were swollen and injected and the cartilage had mainly disappeared. The bony surfaces thus exposed were "superficially carious."

The medulla oblongata and spinal meninges were healthy, but the condition of the brain and its membranes is not noted.

The secondary abscesses were as described above, and in addition abscesses were found in the lungs. There was no disease in the occipital bone in connection with the abscess in this situation.

Remarks.—The great rigidity and the position of greatest ease assumed in this case pointed to acute disease of one or more of the joints of the upper cervical spine. We also think the great œdema causing marked widening of the neck a very important diagnostic sign, as pointing to a small quantity of pus deeply shut up in the situation, a condition of which practically the only cause is acute bone-disease. For this region this sign is also well exemplified in Case III, and in the case of acute osteomyelitis of the supra-occipital bone (*q. v.*), and a similar wide-spread œdema is met with in some of our lumbar cases.

When the secondary abscesses appeared the diagnosis of acute bone disease became almost a certainty.

Note.—Although we have here described this case as one primarily affecting the odontoid process, we have no absolute proof. It is certain that this symmetrical suppurative arthritis of these joints must have been due to disease of either the occipital bone, the atlas, and upper part of the axis. From the post-mortem examination and a careful re-examination of the specimen we can exclude the two former, while we found a small bare patch on the left posterior part of the odontoid process, from around which the periosteum stripped easily, leaving rough bare bone. Beyond a short distance across the back and onto the body of the bone this was impossible. In the preserved specimen there was no pus to be seen.

Our thanks are due to Mr. Ballance not only for permission to quote this case, but for his great kindness in furnishing us with the specimen preserved at the time for renewed examination.

Case III.—*Atlas and Axis.* C. I., female, aged fourteen years. Nine days ago a stiff neck was first complained of, with pain between the shoulders and in the temporal regions. Swelling of the neck ensued in two or three days and progressively increased. There was no history of injury.

On Admission.—Ninth day. The girl did not look very ill, but lay on her back with rigid neck and temperature 103.6° F. The neck was swollen behind and on both sides, and looked markedly broader than normal. The skin over this swelling was hot, but not red, and no fluctuation could be detected.

Tenderness was extreme on either deeper superficial pressure, especially in the midline over the position of the axis, and pain was referred to this point on pressure on the head. The throat was normal and swallowing caused no pain. There were enlarged glands on both sides of the neck.

Tenth day. A deep incision, four inches long, was made in the midline of the neck posteriorly, but no pus was found. A drainage-tube was inserted and the neck and head fixed in a plaster-of-Paris splint.

Eleventh day. Condition was much the same, but with more headache. There was no optic neuritis and no discharge of pus from the wound.

Twelfth day. The swelling of the neck was less, this being due to a sanious discharge from the wound. Tenderness extended as far as the mid-dorsal spine.

Thirteenth day. Pain and tenderness were complained of in both ankles and over tibiæ, also in both elbow- and shoulder-joints. The throat was congested and voice hoarse, but without bulging of the posterior pharyngeal wall.

Delirium supervened during this day with increasing rapidity of both heart and respiration. There was general, but not universal, hyperæsthesia on pressure, suggesting spinal meningitis, but there was no rigidity or paralysis of limbs and the reflexes were normal.

In the evening there was definite stridor with obstruction to respiration, and the patient sank. The temperature was throughout high, varying between 101.8° and 104.6° F.

P.M. The whole of the axis was rough and denuded of periosteum, and there was thick pus in the muscles around the bone. The periosteum of the atlas was soft and easily detached, but the bone was not bare. There was thick, dirty-white pus behind the pharynx in front of the anterior common ligament of the first five cervical vertebræ.

There were no secondary deposits and the viscera merely showed the usual signs of septic fever.

Remarks.—The great œdema causing widening of the neck, referred to under the last case is again exemplified here, where the pus under the deep muscles was so small in quantity, at any rate, at first, as to be missed at the operation.

This is the only one of our cervical cases in which a retro-

pharyngeal abscess formed, the explanation doubtless being that in this case alone were the bodies involved.

From the history it appears to have developed rapidly and to have been the immediate cause of death.

Unfortunately, there is no record as to the condition of the brain, cord, and meninges, but from the symptoms on the last day there is little doubt that there was, at any rate, spinal meningitis.

CASE IV.—*Bodies of Second, Third, Fourth, Fifth, and Sixth Dorsal Vertebræ.* C. B., male, aged fourteen years. Had complained for one week of pain in the back and in the left leg. The pain in the leg subsided, but returned more severely three days before admission, when the leg became swollen, red, and œdematous. A troublesome cough without expectoration had developed gradually during this time, and there had been attacks of shivering at night with profuse sweats.

On Admission.—Seventh day. The boy looked ill with thin, flushed face. There was a red, hot, fluctuating swelling over front of left tibia, with slight effusion into the knee-joint. This abscess and another over the distal joint of the great toe were incised, and much of the tibia was found bare.

Eighth day. Tenderness was noted over the right tibia.

Ninth day. A short, dry cough was incessant without any physical signs in the chest. The wounds looked dry and unhealthy and patchy urticaria appeared on different parts of the body.

Eleventh day. An abscess on dorsum of foot in connection with the second metatarsal bone was opened.

Fifteenth day. Complained more of pain and soreness in the back than before, though this had been present throughout, and he always lay in the supine position. A bed-sore developed over the sacrum and vomiting commenced.

Eighteenth day. Vomiting continued incessantly, with progressive emaciation. The wounds continued dry and another bed-sore appeared over the great trochanter.

Nineteenth day. Was delirious in the night, and this day had frequent hiccough. Died in the evening. The temperature had been irregularly high, ranging chiefly between 100° and 103° F.

P.M. The left side of the anterior surface of the second, third, fourth, fifth, and sixth dorsal vertebræ was bare and eroded, and in

connection with them was an abscess containing about one ounce of pus situated behind the left pleura. There was great distention of the œsophagus and stomach, and the latter contained nearly three pints of foul-smelling fluid. The condition of the legs was as described above, and no secondary deposits were found in the viscera. The brain and cord were not examined.

Remarks.—This case, when admitted, was already suffering from pyæmia, and for a time the secondary symptoms masked the primary disease, which, from the history, the position assumed by the patient, and the post-mortem appearances, we are justified in placing in the vertebræ. The symptoms of a posterior mediastinal abscess, unless of exceptional size, must necessarily be very obscure, though it is possible that the constant dry cough, the hiccough, and, perhaps, also the great distention of œsophagus and stomach were connected with the abscess in this case.

CASE V.—*Body of First Lumbar Vertebra.* J. H., male, aged fourteen years. Had been kicked in the back on the previous day, and on the evening of admission fell ten feet from a scaffold onto his back and right hip, for which he was at once admitted to hospital.

On Admission.—Second day. The boy looked ill and the temperature was 103.6° F. The abdomen was very tense and universally tender. The spine was also tender, especially over the sacrum.

Third day. The boy lay on his back with general hyperæsthesia below the sternum and cried out if the legs or abdomen were even gently stroked. The point of greatest tenderness was over the upper part of the sacrum. Both knee-jerks were absent.

Fourth day. A diffuse puffy swelling was noticed in the lumbar region to the left of the spine. An exploring needle was inserted without result.

Fifth day. The swelling had increased and extended from the sixth rib to the crest of the ilium, being apparently limited to the sheath of the erector spinæ. Under chloroform, the abdomen felt normal, and nothing was made out except the posterior swelling, which was again punctured without result.

Sixth day. Redness and swelling appeared over the right hip. Intermittent retention of urine had been noted for two days.

Ninth day. Although the temperature was lower, the boy looked more ill. He lay constantly on his back with both legs drawn up, and the swelling over the right hip had increased. Urine was passed irregularly and the bowels were only opened by enemata. Under chloroform the buttock was incised towards its anterior part, a counter opening was made behind, and a drainage-tube passed between. Much pus was evacuated. The hip-joint was not involved.

Fifteenth day. The discharge of pus had been very free, fluctuations in temperature had been rapid and sweats were profuse. He always lay in the same position, and a bed-sore developed over the sacrum.

Eighteenth day. Had become extremely emaciated and lay quiet on his back. On pressure in the iliac fossa pus welled out through the lower wound. Died in the evening.

Temperature throughout was irregular, occasionally falling to normal, but generally ranging between 100° and 104° F.

There was a rough, necrotic patch, the size of a sixpence, at the junction of the posterior and left lateral surfaces of the body of the first lumbar vertebra, involving also the root of the pedicle.

From this spot pus had travelled upward and downward along both sides of the vertebral column, under the peritoneum, and also under the psoas muscles, which themselves were healthy.

On the left side this abscess extended as high as the eighth dorsal vertebra and down behind the psoas as far as the brim of the pelvis.

On the right side the upper limit was at the twelfth dorsal vertebra, but the pus could be traced downward under the psoas over the sacro-iliac synchondrosis (itself normal) to the great sacro-sciatic notch.

Through this it entered a spacious abscess cavity which undermined all the muscles on the outer side of the ilium, but was limited by their attachments to the crest of the bone. This abscess had been opened by the incisions above described. Notwithstanding the abundance of pus behind the peritoneum and its (presumably) acutely infective nature, there was no sign of disease in view on opening the abdomen.

There was acute purulent spinal meningitis, the whole of the outside of the theca being bathed in pus, while inside there was lymph and inflammatory exudation on the pia mater.

The pus had extended up to the brain, where there was early but acute meningitis over pons, medulla, and medullo-cerebellar grooves.

The spinal cord itself was hyperæmic, but not inflamed. There was no other disease in the body beyond evidence of septic fever.

Remarks.—The date of commencement of the disease and its relation to even the earlier injury must be doubtful in this case, as on admission the temperature was already 103.6° F. The spinal meninges were clearly early involved, giving definite symptoms of spinal meningitis on the third day. Whether the abdominal distention in this and some other cases was due to the spinal involvement or to the acute abscess in near relation to the peritoneum appears to us uncertain, but in favor of the former view is the fact that at the post mortem there was no obvious change in the peritoneum.

The position of the abscess behind the psoas muscle, and perhaps behind the anterior layer of the lumbar fascia, is a very rare one and made diagnosis of its presence from the front impossible. It evidently depended on the position on the vertebra of the focus of disease, and the only sign of its presence was the diffuse swelling behind limited by the posterior layer of the lumbar fascia.

CASE VI.—*Posterior Arch of Third Lumbar Vertebra.* W. G. B., male, aged ten years. Pain in the back was first complained of ten days before admission. Had been kept in bed for five days, and a swelling noticed by the mother had been poulticed and had rapidly increased in size. Nothing was known of any injury.

On Admission.—Tenth day. The child was very feeble, looked extremely ill, the extremities were cold, pulse rapid, and temperature 102.6° F. There was a large acute abscess over the lower lumbar vertebræ, but the movements of the spine were apparently normal. The abscess was incised and three ounces of thin, sanious pus evacuated. The third lumbar spinous process was bare. A drainage-tube was introduced.

Eleventh day. Passed a restless night, "screaming incoherently." The pulse was weak and running, respirations rapid and shallow, and breath foul. He lay still on his back. Scattered pustules appeared on the legs, and a red swelling developed over the left trochanter major.

Twelfth day. Extremely feeble, and conscious only at times. Diarrhœa became troublesome to-day.

Thirteenth day. Was quite unconscious all night, and in the morning sweated profusely. The right side of the body was markedly rigid, and although unconscious he winced when the legs were touched. Later the left side also became rigid. He grew weaker during the day, was unable to swallow, and died in the evening with temperature 105° F. This had been high throughout, only twice falling below 102° F.

Both laminæ of the third lumbar vertebra were bare, rough, and discolored, and lay at the bottom of the abscess cavity, the incision into which was sloughy. The epiphysis of the spinous process was separated and connected by the interspinous ligament to that of the fourth. The joints of the articular processes were normal. Pus infiltrated the muscles over the lower dorsal and lumbar spine, and on removal of the third and fourth lumbar vertebræ was found to spread into the spinal canal. The membranes of the cord were intensely congested and softened, but the cord itself was normal to the naked eye. The cerebral meninges were normal except for some superficial hæmorrhages. In the brain itself a large area of softened semipurulent material occupied the back part of the parietal and front part of the occipital lobes on the left side, extending through the posterior horn of the lateral ventricle and coming to the under and inner aspect of the surface of the temporo-sphenoidal lobe. Several smaller patches of softening were scattered through the cerebral hemispheres on both sides. There were numerous infarcts and some secondary abscesses in the spleen and kidneys, numerous hæmorrhagic patches with firm white nodules in centre scattered throughout the intestinal walls, similar nodules in the liver, turbid fluid in the pericardium, and much pus in the bronchial tubes.

Remarks.—The diagnosis was easy in this case, as the abscess was obvious, and bare bone was felt after making the first incision. It is possible that removal of the spine and laminæ at this time might have prevented the spinal meningitis, which so soon followed with marked symptoms. The superficial position of the abscess corresponds with that in our other posterior arch cases, and evidently makes the diagnosis in these easy compared to the transverse process cases in which the abscess is deep and difficult to find. On the other hand, spinal meningitis is more common and occurs earlier in the arch cases.

CASE VII.—*Transverse Process of Fourth Lumbar Vertebra.* E. P., female, aged forty-six years. Three weeks ago a doctor was consulted for pain in the back with a sense of illness. This continued, and an abscess was noticed the day before admission. There was no knowledge of any injury.

On Admission.—Twenty-first day. Fairly strong woman, but with anxious expression and look of illness. There was a large superficial abscess in the right gluteal region, resonant on percussion. There were no pain or other symptoms pointing to the spine.

Twenty-fourth day. Abscess was opened under anæsthetic and much fetid pus evacuated. The exploring finger could be passed over the crest of the ilium into the iliac fossa. No bare bone was detected anywhere, so the abscess was washed out and drained.

Twenty-fifth day. There was profuse offensive discharge. Respiration was rapid and diarrhœa troublesome.

Twenty-sixth day. Died rather suddenly with marked shortness of breath. Temperature irregular, varying between 96° and 101.6° F.

A large collapsed abscess cavity extended over nearly the whole of the right gluteal region, superficial to the muscles. This had been drained by the incision above mentioned. On the inner surface of this ilium was a second large cavity containing dark thick pus. This was beneath the iliacus, the muscle being stripped up from the bone over the whole of its attachment to the iliac fossa down to Poupart's ligament. These two cavities communicated with each other by a rounded aperture, admitting the forefinger, just external to the attachment of the quadratus lumborum to the iliac crest, and by small rounded openings situated above and below the transverse process of the fourth lumbar vertebra.

This transverse process was bare and necrosed on all surfaces except at its extreme tip, and its upper edge was eroded and serrated.

The roof of the anterior abscess cavity was formed by the iliacus, the peritoneal covering of which was dark and discolored and covered by shreds of lymph.

On this peritoneum lay the cæcum with the vermiform appendix interposed, and the latter was adherent to the abscess wall.

The rest of the spine and the cord were healthy, and there were no secondary deposits in other viscera.

Remarks.—Here we again have a gluteal abscess, but passing round the crest of the ilium instead of through the sacro-

sciatic notch, and therefore superficial to the muscles. The anterior and posterior abscesses communicating with each other is the same condition we find in other transverse process cases. (*Vide* Case VIII.)

CASE VIII.—*Transverse Process of Fifth Lumbar Vertebra.* H. H., male, aged twenty-seven years, had suffered from pain in sacral region for two weeks before admission, but had continued at work till three days before admission, when the pain became much more acute. In the last two days he had had three attacks of shivering and suffered from diffuse headache. He had had sudden pain in the left hip, which disappeared entirely in a few days.

On Admission.—Fourteenth day. He looked extremely ill, and the temperature was 104.4° F., reaching 105.2° F. at midnight. The headache was general, with pain in the neck on moving head, and the head and shoulders moved stiffly together. The inner edge of the right optic disk was hazy, but the eyes were otherwise normal. The abdomen was gently rounded, not distended, but with rigid walls. General tenderness was most marked above Poupart's ligament on each side. An abnormally visible vein ran up right groin, and the inguinal glands on both sides were enlarged. There was fairly acute tenderness over and around lumbo-sacral area, and this without redness, swelling, or œdema. He lay on his back with the left leg flexed, and attempts to extend it completely gave severe pain. The knee-jerk on this side was brisk. There was partial suppression of urine.

Fifteenth day. The sacral tenderness and headache were less, but there was pain down the left thigh. There was complete retention of urine with a trace of albumen.

Sixteenth day. No headache or sacral tenderness, but the abdomen was still tender, with rigid walls, on which several dilated veins (with downward flow) had made their appearance since the day before. Signs of fluid had made their appearance over the lower half of the right lung behind. Wandered in the night; urine passed naturally.

Eighteenth day. Had been incessantly muttering and looked more ill. Except in abdomen there was no tenderness, but this was fuller with general tenderness on deep pressure, but nothing definite to be felt. He now had retention of urine with dribbling.

Twenty-first day. He lay quiet, muttering occasionally, and with

left pupil larger than the right. Retention of urine was complete, and there was no control over rectum. Abdomen was quite flaccid, and some enlarged glands were felt along left psoas. Scattered ronchi over both lungs. He died in the afternoon. Temperature had throughout ranged high, several times reaching 104° F. For several days before death there had been signs of acute nephritis with blood in the urine.

The left psoas muscle was much swollen, and its central part broken down into a large abscess, which did not quite reach either the origin or insertion of the muscle. The transverse process of the last lumbar vertebra was bare and necrosed, and from this point there was a free communication from the psoas abscess to the lumbar spinal muscles in which an abscess also existed. There was also some, but not much, pus in the right psoas.

There was suppuration of the whole of the loose connective tissue between the dura mater and the bones forming the spinal canal. Pus and lymph were found inside the theca from its lower end up to the inferior extremity of the cervical enlargement. The cord itself was normal to the naked eye. The brain and its membranes were healthy, with the exception of a little turbid fluid inside the dura mater.

The lungs were deeply congested with a deposit of fibrin at the right base. The spleen was large and soft. No secondary deposits.

Remarks.—The spinal meningitis in this case was clearly present on admission. The anterior and posterior communicating abscesses were present as in the last case, and the psoas abscess was never diagnosed in spite of most careful examination. The position of the limb was its chief indication, while the abscess in the posterior spinal muscle gave no clue to its presence.

It is probable, though not stated, that the body as well as the transverse process was affected, this being pointed to by the abscess in the opposite psoas and the early affection of the spinal meninges.

The question whether the abdominal distention should be looked upon as secondary to implication of the peritoneum, or as due to a nervous cause, has been already referred to. (*Vide* Case V.)

The marked dilatation of superficial veins noted in some other cases was in this case, at any rate, probably due to pressure on some of the main veins at the back of the abdomen.

CASE IX.—*Supra-Occipital Bone.* S. V. B., male, aged five years. The neck was first noticed to be swollen and painful one week before admission. This swelling steadily increased, with constant pain, and the neck was held rigid. Recently he is said to have had a fall at school, after which pain was complained of in the head and neck, but was soon recovered from.

On Admission.—Eighth day. The child looked ill, carried the head rigidly, and resented attempts at rotation, though pressure on the vertex caused no pain. There was general swelling at the back of the neck with hot skin, but no œdema. This was more marked on the right side and at the back of this sterno-mastoid tender enlarged glands were felt. Hot fomentations were applied.

Eleventh day. A glandular abscess was opened and drained at the posterior border of the right sterno-mastoid.

Seventeenth day. The swelling which for a few days decreased had now become more marked than before. There was much solid swelling of the upper part of the back of the neck, causing marked widening, with œdema spreading onto the scalp, especially on the right side. Although a good deal of pus had escaped from the abscess, the temperature was higher and the child looked more ill.

Nineteenth day. The œdema and swelling had still further increased and rigidity was extreme with retracted head. Under chloroform the original incision was opened up and another vertical incision made one-half inch to the right of the median line. This was carried down to the vertebræ, but no pus or bare bone found.

Twenty-second day. For the first time pus was noticed in the upper part of the posterior incision, from which much serum had previously drained. Pain was complained of in the right hip and some fulness noticed in the groin.

Twenty-sixth day. Definite deep fluctuation was felt over the right hip, which was held rigid and everted. This was incised under anæsthetic and pus found to the inner side of the neck of the femur. A drainage-tube was inserted. The neck wound was again examined, and the pus found to come from a sinus entering its upper part and leading beneath the complexus to a bare patch on the occipital bone.

Thirty-second day. The child had improved, was less irritable and slept well. The wounds were satisfactory, but temperature continued as high.

Thirty-seventh day. Much worse this morning. He lay unconscious on his back with retracted head, frequent meningitic cry, dilated pupils, and occasional deviation of eyes to the right, marked optic neuritis on both sides. Later he became more comatose, and rigidity with occasional contractions of the limbs were noted. The right cerebellar fossa of the occipital bone was trephined. On opening the dura and inserting a searcher towards the base much slightly turbid fluid escaped.

Thirty-eighth day. Death occurred. Temperature throughout was extremely high, generally varying between 100° to 104° F., but had been a degree higher.

There was a rough bare patch, size of a threepenny bit, on the outer part of the cerebellar portion of the occipital bone. Around this the periosteum had been stripped up by pus over a circle nearly one inch in diameter. The bone here was so thinned that a probe outside dented the bone and was easily seen from inside the dura mater, which was not itself perforated. Inside this bare patch was the recent trephine opening and incision in the dura mater. There was general acute meningitis and the base of the brain was bathed in thin sero-pus.

The neck of the femur was entirely bared, rough, and its inner side was bathed in the pus of the abscess which had been opened.

There was a superficial abscess in the right calf. The left pleura contained ten ounces of sero-pus. There were no other secondary deposits.

Remarks.—The likeness of the appearance and symptoms in this case to our other cervical cases was very great, and it was on this diagnosis the second incision was made.

It was not till at a later operation the probe struck bare bone on the occipital that the actual focus was discovered, though we never doubted we were dealing with an acute bone case in this region, and this was confirmed by the secondary affection of the neck of the femur.

The supervention of meningitic symptoms was very rapid, and was the immediate cause of death.

We publish this case on account of its great rarity, and because if another should occur in this position it must give exactly the same signs as a case of acute osteomyelitis of the upper vertebræ, the signs being due to a small quantity of pus shut up beneath the deep muscles of the back of the neck. The possibility of the lesion being of the occipital bone when these symptoms are met with should therefore be kept in mind.

The above cases have been recorded with some amplitude, since taken together they present a fairly complete clinical picture of the disease; we shall now proceed to give a short account of the affection as deduced from them, but making use also, where numbers are required, of the cases already published or collated by Hahn and Müller, in order to make the statistics of greater value.

Frequency of Occurrence.—Reliable statistics on this point can only be obtained in the future, since an examination of published cases shows that the affection has been as commonly overlooked, as osteomyelitis of the bones of the limbs often was, only a few decades since. Hahn,[1] however, by employing the statistics of Frohner[2] and Haaga,[3] and adding some additional cases, shows that of 661 cases of infective osteomyelitis, the long bones were the seat of the disease in 610 instances, the short and flat in fifty-one instances (7.7 per cent.). Among the fifty-one short and flat bones one vertebra only was found, thus only 2 per cent. of the short and flat bones. These numbers, perhaps, are the less valuable, since they contain a large number of cases terminating in a chronic course and recovery, while the cases included in this paper show a very high rate of mortality. In connection with this point reference may be made to a paper by ourselves[4] on forty-one fatal cases of acute infective osteomyelitis, occurring during seventeen years (1872–1889), in St. Thomas's Hospital, which included one instance of affection of the vertebra.

[1] Loc. cit., p. 264.

[2] Beiträge zur Kenntniss der akute spontan Osteomyelitis der kurzen undplatten Knochen, Beiträge zur klinische Chirurgie, Band v, Heft 1, p. 79, 1889.

[3] Loc. cit.; Beiträge zur Statistik der akute spontan Osteomyelitis der langen Röhrenknochen, p. 49.

[4] St. Thomas's Hospital Reports, Vol. xix, p. 193, 1889.

While during this period one case was certainly overlooked, and three have been observed since. It is certainly remarkable, however, considering the multiple lesions so characteristic of this disease, that the vertebra have not more commonly formed the seat of secondary deposits in recorded cases, especially considering the large number of epiphyses, and the frequency with which the vertebræ form the seat of secondary deposit in tubercular and malignant disease.

Sex.—Analysis of the twenty-one cases shows eleven to have been males and four females, while in six the sex is not given.

Age.—Examination of this point shows that the cases were distributed over the whole period of growth of the skeleton, one case occurring at twenty-seven, a time sufficiently approximate to the usual date of complete solidification of the vertebra to make it an exception of little moment, and one at forty-six, an example of the rare occurrence of acute infective osteomyelitis at adult age.

	Total.	Age.
Under two years	1	23 days.
From two to five years	2	3 and 4 years.
From five to ten years	2	6 and 8 years.
From ten to fifteen years	8	10, 10, 12, 12, 14, 14, 14, and 14 years.
From fifteen to twenty years . . .	3	17, 17, and 18 years.
From twenty years and over . . .	3	21, 27, and 46 years.
Not stated	2	
Total	21	

Seat of the Disease.—Every region of the spinal column was affected in one or other of the cases, a matter of great and primary importance in determining not only the position of the abscess, but also the special symptomatology, as will be shown later, each affection of each region possessing its special diagnostic signs.

Region.	Total.	Vertebræ affected.
Cervical	3	Atlas 1; axis 1; atlas and axis 1.
Dorsal	5	2d, 2d, 3d, 4th, 5th, 6th, 8th, 9th, 10th, and 12th.
Lumbar	10	1st, 1st, 1st, 3d, 3d, 3d, 4th, 5th, 4th, 4th 5th, 5th, and 1st sacral.
Sacral	1	1st.
Unrecorded	2	One probably lumbo-sacral.
Total	21	

The above table shows a large preponderance of lumbar disease, while if we add to the ten lumbar cases the one attacking the twelfth dorsal vertebra, and two others that attacked the first sacral and the probable lumbo-sacral case, we have thirteen cases out of twenty-one, or 62 per cent., distributed between the twelfth dorsal and first sacral, about one-third of the entire length of the column.

The next point of importance, the seat of the disease in the centrum or neural arch, comes out as follows:

In four cases the centrum only, and in five others the centrum and some portion of the neural arch were affected.

In seven the disease was confined to the neural arch, attacking the spine in three instances, the transverse process in three, the pedicle in one, and the articular process in one.

In four cases the exact locality of the disease is not reported.

Suppuration of the contiguous articular process joints is only mentioned twice, and in two cases more or less complete destruction of the intervertebral disks is noted. In two cases suppuration extended into the costo-central rib articulation, and in one to the sacro-iliac synchondrosis.

As would be expected, the localization in the centrum or neural arch respectively has an important determining influence on the occurrence of spinal meningitis or myelitis. One or other of these conditions was met with in eleven out of the whole twenty-one cases, and on analyzing these we find in five the neural arch alone, in two the neural arch and body, and in two the centrum only was affected, while of the remaining two no details as to position are available.

Occurrence of Suppuration and Position of the Abscess.—It may be broadly stated that in every case suppuration occurred, although in very varying extent, while the position of the abscesses corresponded closely with the seat of the primary disease and the portion of the vertebra affected. Thus, in every case of affection of the centrum (except one in which the transverse process was also involved, Lannelongue's case), the abscess was anterior, either post-pharyngeal, mediastinal, psoas, or pelvic, according to the region affected; while in every instance of implication of the neural arch the abscess was posterior. When the transverse process is affected the abscess travels in both directions. The position of the abscess is therefore a most important point both as regards diagnosis and treatment.

Cervical Abscess.—Three. In one case where the atlas alone was affected, the abscess formed posteriorly close to the median line, in a second the primary suppuration was mainly confined to the occipito-atlantal joints, and in the third where both atlas and axis were affected the abscess was post-pharyngeal. The writers' experience gained in the preparation of this paper leads them to suspect strongly that acute osteomyelitis of the spine may be the primary cause of a fair proportion of the acute post-pharyngeal abscesses observed in children, but they are unable to offer any definite information on this point.

Dorsal Abscess.—Three. In one case the neural arch alone, in one the neural arch and body were affected, a posterior mediastinal abscess being also present, and in one case no mention is made of the part of the vertebra affected.

Dorso-Lumbar Abscess.—One. The first lumbar spine being the affected part.

Lumbar Abscess.—Five. In all the neural arch was the point of departure, but in two cases the disease extended to the centrum, and both of these had communicating double psoas abscesses.

Lumbo-Sacral Abscess.—Two. In both the disease was in the posterior arch.

Psoas Abscess.—Four. In all the centrum was affected, and three of the cases were double.

Mediastinal Abscess.—Two. Both in connection with disease of dorsal bodies.

Pelvic Abscess.—Three. All pointing in gluteal region, two escaping by the great sciatic notch, and one over the iliac crest.

Curvature.—In two cases slight angular curvature was noted, but in neither was this permanent. One case was treated with a Sayre's jacket, and as to the other no details are available, but both cases recovered completely. The course of the disease is, however, too acute for curvature to commonly occur, while, as has been pointed out by Müller, the facts that the patients maintain habitually the supine position, and that free new bone formation is a special characteristic of this form of disease, both militate against its development.

Implication of the Spinal Cord and Meninges.—This complication lends especial interest to the disease on account of the comparatively rare occurrence of acute inflammation of the cord and its membrane, and the possibility that acute osteomyelitis from its rarity in the vertebræ has been overlooked as the cause in a considerable number of instances of so-called spontaneous acute spinal meningitis or myelitis. Nerve complications, moreover, formed the direct cause of death in a large percentage of the cases we are dealing with. In the whole series of twenty-one, the cord or membranes were invaded in eleven instances, giving a percentage occurrence of 52.4.

The condition, however, was extremely variable, both as to extent and degree. In two cases pus had collected in quantity on the outer surface of the dura mater, which when opened disclosed no further sign of inflammation; in two well-marked suppurative general spinal meningitis was found; in one spinal meningitis had extended to the base of the brain, and cerebral abscess had formed secondarily; in two meningomyelitis was found; in one case which recovered the myelitis became chronic, leaving definite signs of degeneration; in one case, unfortunately without a complete post-mortem examination, signs of meningitis were noted during life; and in one case of basal meningitis where the primary disease affected the lumbar spine, the meningitis must probably be regarded as metastatic.

The etiological importance in respect to the occurrence of nerve complication, affection of the body or neural arch of the vertebræ has been already referred to.

Secondary Deposits.—These are noted in twelve cases (60 per cent.), and in all of them the disease proved fatal, the distribution in no way deviated from that seen in cases of acute infective osteomyelitis generally.

Pathology.—In only six of the cases was a bacteriological examination properly carried out, but in these pure cultures of staphylococcus pyogenes aureus were obtained.

The morbid anatomy corresponds exactly with that observed in the long bones, the most striking points being the multiple foci formed when the disease attacks the centre, and the comparatively narrow limits within which the bone of the neural arch is often affected. The latter point, no doubt, depending on the dense nature of the muscular attachments to the prominent points of the arches.

Symptoms.—The general symptoms and the course of acute infective osteomyelitis of the vertebræ differ in no essential particulars from those observed when the same disease attacks the bones of the limbs. The local signs, however, do present special characteristics, and these differ strikingly according to the segment of the spinal column affected, while the frequent implication of the spinal cord or its meninges endows the disease with its chief importance and interest.

Mode of Onset.—The illness commences suddenly, sometimes spontaneously, at others after an injury, often slight in nature. The patient suffers with malaise, local indefined pain, fever often accompanied by an initial rigor, and when he comes under observation presents the aspect of extreme illness usually observed in acute bone cases. At an early stage a tendency to assume the supine posture is to be noted, also tenderness and rigidity of the affected portion of the spine.

The patient may remain in this condition for some days, the fever and illness persisting, and then local signs may commence to point to the actual seat of disease.

When this is the neural arch or any of its processes, the signs consist in the development of œdematous swelling and tenderness over the back, both being wide-spread, and often no definite spot can be localized as the focus of the disease. This swelling is rarely detected before the third or fourth day, and in

many of the recorded cases not before the eighth or tenth, although in some of these its first appearance probably escaped observation, as disease of the spine had not up till that time been entertained as a possible diagnosis. The swelling may start centrally and spread in each direction when the spinous process or the neural arch in its immediate neighborhood is the part primarily affected, or it may be unilateral when the transverse process or lateral portion of the arch are attacked, often spreading widely over the ribs.

The swelling, at first purely œdematous, becomes indurated centrifugally, offering the characters of a firm cellulitis, and eventually the part nearly overlying the affected bone softens, and an abscess is developed. This stage may not be reached until the tenth day, and in many of the recorded cases the abscess was not observed until a much later date. When the abscess is opened, denuded bone is generally detected at the bottom and the diagnosis may be confirmed or made.

The most striking characteristic of this group of signs is the wide-spread area of the soft parts affected compared with the extent of the bone-disease, and although this may be said to characterize the same disease in the extremities, yet it is certainly a more marked feature in disease of the spine, no doubt, on account of the comparative depth in situation of the bone and the very firm nature of the muscles and aponeuroses covering it, through which infective process can only with difficulty extend. The œdema is more than usually solid to the feel, which is, perhaps, accounted for by the naturally dense character of the skin in this situation, and also because from the position assumed by the patient the seat of the disease forms the most dependent part of the body. In a considerable number of the cases great distention of the superficial veins over the surface of the abscess has been noticed.

When the body of the vertebra is affected the signs are not so straightforward, and the difficulties of diagnosis may be immensely increased. Here the abscess is situated still more deeply, and, as it cannot so readily reach the surface, it does so at a much later date, as even when suspected it may not be possible to localize it with sufficient precision to attack it. In the early

stages, therefore, the tendency to maintain the supine posture, rigidity of the spine, and pain on movement, taken together with the general condition of the patient in the absence of any indication of visceral disease may be the only signs to depend upon, unless nerve complications arise. It should be mentioned here, also, that in rare cases the first notable symptoms have been those due to implication of the cord or meninges.

Meanwhile the course of the disease, as evidenced by the general symptoms, closely resembles that observed in acute infective osteomyelitis of the bones of the extremities. The patient lies in the supine position, is extremely ill, the sensorium is benumbed, delirium often supervenes early, the temperature continues high with slight morning remissions, ranging between 100° and 104° F., or higher. The pulse is rapid and becomes small and feeble, the respirations are quickened, the urine is scanty and high-colored, often containing albumen, the tongue becomes dry, sordes may collect upon the teeth and lips, and diarrhœa may be a troublesome complication.

To these symptoms may be added those due to secondary deposits either in the viscera, in the bones and joints, in the connective tissue of the body generally, or in the skin, as evidenced by a pustular eruption.

Special Symptoms in the Cervical Region.—Stiffness and rigidity of the neck is usually the earliest sign, when the neural arch is affected the swelling and abscess are limited to the back of the neck, when the body is affected the abscess is more likely to be post-pharyngeal, and may give rise to the swelling, pain, and difficulty in deglutition ordinarily noticed in abscesses in this region.

In Cases II and III, however, in which the upper cervical vertebræ were implicated (and also in Case IX, affecting the occipital bone), symptomatic swelling of the back and sides of the neck with marked widening was the most prominent sign, but in none was pus found in this situation. In Case II the occipito-atlantal joints were affected, and for the special and characteristic attitude assumed we would refer to Mr. Ballance's excellent description.[1]

[1] Loc. cit., p. 888.

Headache was an early and prominent symptom in all the cervical cases, and in two of them certainly, and in the third probably, basal meningitis supervened. In Case IX (occipital bone) the same sequence was observed. In Case I, one special point, the escape of abundance of cerebro-spinal fluid by the abscess cavity on the fourth day after incision should be emphasized, as this occurrence led to a correct diagnosis of the nature of the case.

Special Symptoms in the Dorsal Region.—In the dorsal region the abscess may be either dorsal or mediastinal. The difficulty of diagnosing the latter need hardly be dwelt upon, dysphagia from pressure upon the œsophagus, the appearance of pleural or pulmonary symptoms from direct extension of the inflammation, and possible signs of pressure upon the other structures, such as veins or nerves, together with the general signs already described are the main elements in the diagnosis of such cases. (See Case IV, p. 516.)

Special Symptoms in the Lumbar Region.—Where the neural arch is affected, a lumbar, dorso-lumbar, or lumbo-sacral abscess commonly develops. When the disease attacks the centra, on the other hand, an acute psoas abscess is the result, this is often double, and gives rise to the ordinary signs of local pain, tenderness, swelling, flexion of the thighs, and pain on movement of the hip-joints. The abscess, however, is a more acute variety than that usually met with, and this probably accounts for the prominence of one group of signs which commonly at first throw all others into the background,—viz., *distention of the abdomen*, accompanied by pain and tenderness. These signs were prominent in five out of the ten cases of lumbar osteomyelitis (50 per cent.), and also developed in the case in which the twelfth dorsal vertebra was affected. In three of these cases the disease was in the centrum, in two cases in the neural arch, and in one no details as to position are available. Especial prominence is given to these symptoms since they have given rise on more than one occasion to the erroneous supposition that the case was one of either enteric fever or peritonitis, and the possibility of the repetition of this error is the greater since the abscesses travel slowly,

consist mainly of an active local disintegration of the muscle not reaching a large size at first, and hence are extremely difficult of recognition.

One point, however, is worthy of especial note,—viz., that in more than one instance a psoas abscess directly communicated with one in the lumbar region through the interval between the transverse processes, and the possibility of the occurrence should be borne in mind in whichever of the two positions the abscess is first found.

Special Symptoms in the Lumbo-Sacral and Sacral Region.—As in tubercular disease of the lower lumbar and sacral vertebræ, the local signs are here very indefinite. The prominent one is an acute pelvic abscess usually escaping by the great sciatic notch, this preceded by pain both local and in the distribution of the sacral plexus of nerves. One especial complication has been noted in the extension of suppuration to the sacro-iliac joint. In another case a lumbo-sacral abscess formed concurrently with one by the pelvis.

Symptoms Dependent on Implication of the Spinal Cord, Nerves, and Meninges.—These symptoms, although due to secondary extension, are yet occasionally those which first attract clinical notice. The usual premonitory symptoms of meningitis or myelitis may pass unnoticed in consequence of the serious general condition of the patient, later signs of both sensory and motor disturbance occur. Thus, shooting pains in the limbs, hyperæsthesia, anæsthesia over wide sensory areas, twitchings, tremors, convulsions, and complete paralysis, involving limbs, trunk, rectum, and bladder. When the primary disease is in the neighborhood of the cervico-dorsal junction, pupil symptoms may develop, or this may point to wide-spreading of the inflammatory process. A word should be said as to the distention of the abdomen, which forms so prominent a symptom in disease of the lumbar vertebræ, as this is possibly due to direct implication of the spinal nerve-roots and the sympathetic ganglia and their connections.

Diagnosis.—The difficulty of recognizing these cases is undeniably great, as may be judged by the fact that they have

been mistaken for enteric fever, pneumonia, peritonitis, Landry's paralysis, acute spontaneous spinal meningitis, etc.

It should, however, with the accumulation of experience, become somewhat less difficult, and the following points may be suggested:

In the first place, the history and general condition of the patient is usually such as at any rate to suggest the possibility of acute bone mischief, and to this may be usually added the cardinal sign of disease of the vertebral column, rigidity either general or local, and the tendency of the patient to assume and maintain the supine position. Later, local swelling, with the special diffuse character already emphasized, with gradual tendency to circumscribed softening, will be a valuable aid in all neural arch cases. Especial care must be exercised in sifting abdominal symptoms, for the pain, tenderness, and distention naturally first point to visceral inflammation, and can only be utilized for this disease in connection with rigidity of the spine, or some evident signs of local inflammation in the back. With regard to the diagnosis from enteric fever, it should also be pointed out that enlargement of the spleen is usually present in acute infective osteomyelitis, so that this sign is of little diagnostic utility.

Signs of meningitis and myelitis are, on the whole, of decided importance in forming an opinion, firstly, because this disease is probably one of the commonest, if not the commonest, cause of acute inflammation of the cord and membranes, and, secondly, because, as a rule, they do not appear until the other symptoms are well marked. In connection with the possibility of confusion with Landry's paralysis, the enlargement of the spleen in either disease must again be borne in mind.

Secondary deposits, which often occur early, especially in other bones, and the skin giving rise to pustular eruptions, may also be aids to the formation of a correct opinion, or the revision of an earlier erroneous diagnosis in the later stages.

Prognosis.—Of the twenty-six cases here referred to, fifteen, or 71.4 per cent., died, and even under the most favorable conditions, it is to be feared that this mortality cannot be more than

slightly reduced. Three cases were relieved (14.3 per cent.), and the fact that in one of these myelitis was present is a hopeful feature, and three cases (14.3 per cent.) were cured. In thirteen fatal cases in which the duration of the disease is given, it averaged 25.2 days, with extremes of thirteen and forty-five days.

As far as the material to hand goes, it may be said that, on the whole, affection of the neural arch is a more favorable condition than that of the body, although nerve complications are more frequent. This opinion is based on the facts that the disease is more likely to be able to be recognized at an early stage; that sequestra are more readily removed, and on the observation that the collection of pus on the surface of the dura mater is not necessarily followed by the development of meningitis, so that sufficiently early incision may arrest further mischief. With regard to disease of the centra, only increased experience can show whether a more exact knowledge of the affection will allow the abscesses to be earlier detected and treated when the suppuration is within the limits of the attachment of the psoas. Cases of posterior mediastinal abscess from the difficulty of localization are naturally less hopeful. The only case of post-pharyngeal abscess in the series was so limited as to offer little help; but it is to be assumed that this would scarcely be a general rule, and abscess in this region is, fortunately, comparatively easy both of diagnosis and treatment.

Treatment.—The general lines differ little from those to be observed in the same disease in other regions. The only special points to bear in mind are the necessity for rest to the spinal column, to be maintained by attention to the position of the patient, the early detection and incision of abscesses, and the removal of necrosed bone. The last point is particularly important when the neural arch is the part affected, and, in the opinion of the writers, if the disease extends the whole vertical depth of one side of the arch the bone should always be removed, in order to insure against the possibility of pus collecting in the canal.

The later treatment, when the bodies are the seat of the disease, naturally includes the application of a jacket.

SYNOPSIS OF TWENTY-ONE CASES OF ACUTE PRIMARY OSTEOMYELITIS OF THE VERTEBRA.

No.	Author and Reference.	Sex.	Age.	Portion of Vertebra.	Locality of Abscess.	Implication of Cord and Meninges.	Result.
					Cervical Region.		
1	R. Clement Lucas, Lancet, 1889, Vol. 1, p. 883.	M.	7	Atlas; posterior arch.	Nape of neck.	Meningitis.	D.
2	C. A. Ballance, Lancet, 1884, Vol. 1, p. 888.	M.	6	Axis; odontoid process.	Occipito-atlantal joints.	No.	D.
3	Case 3, p. 514.	F.	14	Atlas and axis.	Post-pharyngeal.	Meningitis.	D.
					Dorsal Region.		
4	Müller, Deutsche Zeitschr. f. Chir., Band XLI, Heft 6, p. 448.	F.	12	Dorsal II, arch.	Cervico-dorsal.	Meningo-myelitis.	D.
5	Case 4, p. 516.	M.	14	Dorsal II, III, IV, V, VI.	Post-mediastinal.	No.	D.
6	Witzel-Hahn, Beit. z. klin. Chir., Band XIV, Heft 1.	F.	3	Dorsal VIII, IX.	. . . . .	. . . . .	R.
7	König-Hahn, l. c.; Lehrbuch der Chir., Band III, p. 97.	. .	. .	Dorsal X.	Dorsal.	Myelitis.	C.
8	Morian, Deutsche med. Wochen., 1893, p. 1258.	M.	17	Dorsal XII, body and arch.	Post-mediastinal and dorsal.	Meningitis.	D.
					Lumbar Region.		
9	Hahn, Beit. zur klin. Chir., Band XIV, Heft 1, p. 261.	M.	8	Lumbar I, spine.	Dorso-lumbar.	No.	C.
10	Totherick, Lancet, 1885.	. .	15	Lumbar I, body.	Double psoas.	Pus in canal; no special meningitis.	D.
11	Case 5, p. 517.	M.	14	Lumbar I, body and root and pedicle.	Double psoas, pus beneath muscle.	Meningitis.	D.
12	Case 6, p. 519.	M.	10	Lumbar III, arch.	Lumbar.	Meningitis.	D.
13	Lannelongue, De l'Ostéomyélite aiguë pendant la croiseance, Paris, 1879, p. 155.	M.	12	Lumbar III, body and transverse process.	Lumbar.	No.	D.
14	Joel-Hahn, l. c.	M.	21	Lumbar III, IV, V, body.	Double psoas.	Meningitis.	D.

SYNOPSIS OF TWENTY-ONE CASES OF ACUTE PRIMARY OSTEOMYELITIS OF THE VERTEBRA.—(Concluded.)

No.	Author and Reference.	Sex.	Age.	Portion of Vertebra.	Locality of Abscess.	Implication of Cord and Meninges.	Result.
15	Morian, l. c.	M.	10	Lumbar IV, spine.	Lumbar.	. . . . .	C.
16	Case 7, p. 521.	F.	46	Lumbar IV, transverse process.	Iliac and gluteal.	No.	D.
17	Case 8, p. 522.	M.	27	Lumbar V, transverse process.	Double psoas and lumbar.	Meningitis.	D.
18	Chipault, Études de Chirurgie medullaire, 1893, p. 366.	. .	4	Lumbar V and sacrum.	Pelvic and sacral.	. . . . .	C.
					Sacral Region.		
19	Valleix-Hahn, l. c.	. .	23 days.	Sacral I, body.	Pelvic.	. . . . .	D.
					Unstated.		
20	Poirier-Hahn, l. c.	. .	14	. . . . .	Lumbo-sacral.	Meningo-myelitis.	D.
21	Hurin-Hahn, l. c.	. .	. .	"Acute kyphosis."			

RESEARCH ON THE SURGICAL ANATOMY OF THE MIDDLE MENINGEAL ARTERY.[1]

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THE large number of methods given for locating the trephine opening for the exposure of the middle meningeal artery, and the entire absence of any reference to their relative values in our English text-books, led me to institute the researches which furnish the material for this paper. The practical end which I had in view was to determine whether any one of these methods was so far superior to the others as to warrant its selection by preference, and to ascertain the advantages and disadvantages of the various methods.

The meagreness of the descriptions of the middle meningeal artery in our English anatomical treatises in proportion to its surgical importance, the wide variations of these descriptions from each other, and the equally wide variations of the course of the artery in various skulls from the description given in any of the books, led me to precede my investigations as to sites for trephining by research upon the course of the principal branches of the artery.

Some other points of interest have also taken some of my attention.

The investigations made consisted of the examination of the course of the artery on both sides of fifty skulls from the osteological museum of the Northwestern University Medical School, and of thirty operations upon the cadaver, made in the laboratory of operative surgery in the same institution. The skulls used,

[1] Read before the Chicago Medical Society, February 17, 1896.

being those of subjects brought to the college, are from adults, and frequently from those past middle life or even in advanced years. It is necessary to state this because of variations in the artery which take place at various ages.

Course.—My researches on the course of the artery were confined chiefly to its intracranial portion.

In describing the course of the artery I have treated it as it appears on the inner surface of the skull, and it must be borne in mind that the location of the sutures on the inside of the skull does not correspond to that on the outside, owing to the overlapping of the bones composing the sutures. The lower part of the coronal suture, for instance, is from one-half to one centimetre farther back on the inside than the outside, owing to the overlapping of the frontal by the parietal in this location. The squamo-parietal suture, for a like reason, is from one to one and one-half centimetres or more lower on the inside than on the outside of the skull.

The artery is described as lying between the bone and the dura mater, but I have been able to show that a demonstrable layer of the dura, or perhaps I might be more correct in saying, a process from the dura, covers the outer surface of the artery and its branches, so that when the dura is separated from the bone, the artery clings to the former. This adherence to the dura is very firm, so that the artery is separated from it with great difficulty only. I would infer from this close adherence that in cases of extradural hæmorrhage the artery would be found beneath the clot in all cases, never adhering to the bone unless held in contact with the latter by running in a canal.

Presence of a Main Trunk within the Cranium.—I found that in 95 out of the 100 arteries examined there was present within the cranium what I have denominated the main trunk, which divided at a greater or lesser distance from the foramen spinosum into two branches, an anterior and a posterior.

In one skull only did the artery divide on both sides at the foramen spinosum, while in one it divided at this location on the right side, and in another upon the left side. In one skull the artery on the left side entered as two separate branches, the

anterior and posterior, through two foramina spinosa of equal size, one situated just in front of the other.

Point of Division of the Main Trunk.—The point of division of the main trunk into the anterior and posterior branches is at a distance of from 0.2 to 5.5 centimetres from the foramen spinosum, measured in a direct line, being under one centimetre sixteen times, between one and three centimetres sixty times, and over three centimetres nineteen times.

The point of division is located on the temporal bone in fifty-eight cases, on the sphenoid in twenty-one, on the squamo-sphenoidal suture in fifteen, and on the spheno-parietal suture once.

In the course of my article I shall have occasion to refer to the exhaustive article of Steiner on the same subject, published in 1894.[1] He found in 100 skulls that the point of division occurred in 57 per cent. at the foramen spinosum, a main trunk being present in only 43 per cent. of cases.

Length of the Main Trunk.—The length of the main trunk corresponds with the distance from the foramen spinosum to the point of division, being practically identical if this distance is not above two centimetres, but being from 0.1 to 1.2 centimetres greater when this distance is above two centimetres, the difference being due to the curved course of the artery.

Steiner gives the length of the main trunk in the forty-three cases in which a main trunk was present as from one to 3.5 centimetres in forty-three (*sic*) cases, and from 3.5 to five centimetres in eight.

Direction of Main Trunk.—The main trunk upon leaving the foramen spinosum passes in nearly every case at first outward, either directly or inclined somewhat backward or forward. Unless the trunk is a short one it changes its direction, after running a distance of from 0.2 to 1.7 centimetres, to forward and outward. In those cases where its primary direction was outward and forward, it turns more forward. When the trunk is very long, its terminal portion is directed either upward or upward and backward.

[1] Zur chirurgischen Anatomie der Arteria meningea media, Archiv für klinische Chirurgie, Band XLVIII, 1, 101.

Curves of Main Trunk.—Nearly every main trunk, unless very short, has at least a gentle curve; trunks of moderate length inclining more forward at their terminations than at their beginning. In some cases the curves are much more decided, approximating a right angle in eleven cases, and being but little greater than a right angle in six more. As seen above, long main trunks may have a second curve.

Location of the Main Trunk.—From the foramen spinosum the main trunk passes on to the temporal bone, either immediately, as in the great majority of cases, or after a short course upon the sphenoid bone or squamo-sphenoidal suture. Upon the temporal bone it is usually between one-half and one centimetre from the squamo-sphenoidal suture. From the temporal, if the trunk is long, it passes, almost invariably, onto the great wing of the sphenoid, occasionally lying upon the squamo-sphenoidal suture for a short distance first.

Anterior Branch.—The anterior branch is generally larger than the posterior and in a considerable percentage of cases appears to be a continuation of the main trunk.

Direction and Location of the Anterior Branch.—In the ninety-five cases in which a main trunk is present, the point of division occurs on the squamous portion of the temporal in fifty-eight. In these, of course, the first portion of the anterior branch lies on this bone. These, with rare exceptions, cross the squamo-sphenoidal suture, and from this on, take a course similar to that of those beginning on the squamo-sphenoidal suture or great wing of the sphenoid,—namely, forward and upward across the upper part of the great wing.

The prevailing primary direction of the anterior branch on the great wing of the sphenoid is, as has been mentioned, forward and upward. Whatever its primary direction, it almost invariably describes a curve on the upper part of the great wing, so as to become directed more backward. This curve varies from a very gentle one to one approximating a right angle, as occurred in twelve cases, intermediate grades varying between these two extremes.

From the upper portion of the great wing of the sphenoid

the anterior branch passes across the spheno-parietal suture onto the parietal bone. The point of crossing is anterior to the middle of the suture in more than 75 per cent. of cases, being immediately back of its anterior extremity,—that is, immediately posterior to the coronal suture, in 40 per cent. In the four cases where the anterior branch does not cross the upper part of the sphenoid it, at least, lies upon the spheno-parietal suture. It will thus be seen that, for practical purposes, it may be said that in every case the anterior branch crosses the spheno-parietal suture, the point of crossing being at either extremity or at any intermediate point, but generally on the anterior half. As the length of the suture is from one to 1.5 centimetres, the greatest distance from the lower extremity of the coronal suture at which the anterior branch may cross it is 1.5 centimetres.

The distance of the anterior branch behind the external angular process of the frontal bone varies from 1.7 to 3.7 centimetres, being between two and three centimetres in most cases. It is measured on a line drawn horizontally backward from the extremity of the process, which reaches the artery on the upper part of the great wing of the sphenoid. In a few cases where the main trunk is long, it is reached instead of the anterior branch.

On the parietal bone the anterior branch takes a direction upward, or, more frequently, upward and backward, approximately parallel with the coronal suture.

In forty-four cases the anterior branch does not divide. In these cases its course may be said to fall under one of the following four heads: (1) Parallel with the coronal suture and lying practically the same distance behind it as far as its termination at the sagittal suture. This distance may vary from 0.2 to three centimetres, generally being less than one. Under this head are twenty-three cases. (2) Parallel with the coronal suture at first, being within a distance of 1.1 centimetres from it, and then diverging so as to be from two to three centimetres posterior to it at the sagittal suture. Under this head are ten cases. (3) With a long curve convex posteriorly at first near to the coronal suture, then diverging to a distance of between one and two centimetres

and approaching close to the coronal suture at its junction with the sagittal. Under this head are six cases. (4) At first parallel with coronal suture, and one to two centimetres from it, then approaching quite closely to it and again diverging to a distance from 1.2 to two centimetres at its upper extremity.

The description under the first head corresponds closely to that in Morris's "Human Anatomy."

That under the second approximates that of Steiner.

In fifty-six cases the anterior branch divides, twenty-five times on the right and thirty-one times on the left side. In forty-nine cases it divides into two branches, in five into three branches, and in two into four branches. Four times the division takes place in a bony canal.

As to the location of the point of division of the anterior branch, it occurs twice on the sphenoid, three times on the spheno-parietal suture, and in the remaining fifty-one cases on the parietal.

When the anterior branch divides, the description of the courses of its divisions may mostly be included under these heads: (1) Where one division passes upward (and perhaps slightly backward) parallel to the coronal suture and generally within 1.5 centimetres of it, and the other passes obliquely upward and backward. This occurs in thirty-one cases, which is a majority of all the cases where the anterior branch divides, and corresponds rather closely to Krönlein's[1] description of what he considered an average case, which follows: "The anterior branch divides into two principal branches (Hauptzweige), of which the one runs in front of the sulcus of Rolando, the other behind it." I did not study the locations of the two divisions in relation to the sulcus of Rolando, but know that in many cases they would conform to Krönlein's description.

(2) Where both divisions pass upward parallel with each other and with the coronal suture. This occurs in seven cases.

(3) Where both divisions diverge from the coronal suture, passing obliquely upward and backward, so that the anterior

[1] Deutsche Zeitschrift für Chirurgie, 1886, Band XXIII, S. 209–222.

division is from 1.8 to three centimetres, posterior to the coronal suture at its upper extremity. This occurs in seven cases. In the other eleven cases the variations are so great as to prevent classification. One thing noticed in common with them is that in all one of the divisions runs parallel with the coronal suture and within 1.5 centimetres of it through a considerable portion of its course. It will thus be seen that in a great majority of all cases the anterior branch or one of its divisions lies parallel to and within two centimetres of the coronal suture.

Branches of the Anterior Branch.—A branch which is generally found, although small, is the ramus fronto-basilaris. Most frequently its origin is just above the exit of the anterior branch from the bony canal when the latter is present, although it sometimes arises inside the canal, escaping from it by a special orifice or small canal. The ramus fronto-basilaris takes a course in a downward and forward direction, frequently running upon the interior surface of the bony ridge lying along the lower part of the coronal suture. It terminates upon the upper surface of the horizontal plate of the frontal bone. This branch may arise low down and perforate the orbital plate from below to reach its destination.

One or more posterior branches are often given off from the anterior branch prior to its division, when the latter occurs, or in a corresponding location where there is no division. The first of these generally is located entirely upon the parietal bone, being directed either horizontally backward or obliquely upward and backward and lying between one and three centimetres above the spheno-parietal and squamo-parietal suture. Its first portion may, exceptionally, be upon the sphenoid or temporal bone.

The second posterior branch, occurring with a little more than one-third the frequency of the first, lies within 1.5 centimetres above the former. It is very seldom that a branch from the anterior branch reaches the occipital bone, instead of being the rule, as Gray's description would lead one to expect.

Posterior Branch.—The posterior branch is generally smaller than the anterior, sometimes being so small that the main trunk

can scarcely be said to divide into an anterior and posterior branch, but rather to give off the posterior branch and continue as the anterior branch. On the other hand, the posterior branch sometimes (in eight cases) appears, from its direction, as the continuation of the main trunk, at the same time being in rare cases larger than the anterior branch. In other cases again, the posterior branch, while not having the direction of the continuation of the main trunk, is larger than the anterior branch. This I noted seven times.

It is sometimes difficult to establish the identity of the posterior branch; for the main trunk occasionally gives off near its origin a small posterior branch which runs along the squamo-petrosal junction, and passes a short distance on to the parietal bone. When this branch is small, it corresponds to the external petrosal branch of Steiner, which is from the main trunk; but when, as occurs in some cases, it is of comparatively large size, its distribution is similar to that of the posterior branch in an average case, and the question arises as to whether this does not more closely approximate the description of the posterior terminal branch of the main trunk than the next one given off.

Again, confusion may arise, when the first posterior branch given off from the main trunk is small, as to whether this, or what, if this be considered the true posterior branch of the main trunk, would be the first posterior branch of the anterior branch, be more justly entitled to be considered the posterior terminal branch of the main trunk; for these two branches—namely, the posterior terminal branch of the main trunk and the first posterior branch of the anterior branch—are found to have a complementary relation to each other in size and location, the one being small when the other is large, and the branch of the anterior branch being located low when the posterior branch is low or small, and high when the posterior branch is high or large.

In deciding in these cases which one I should designate in my description as the posterior branch, I have chosen the one which in size, location, and distribution resembled most closely

the posterior branch in an average case. In cases where the choice has not fallen upon the first branch, running posteriorly from the main trunk, this branch is described as an accessory posterior branch.

Direction and Location of the Posterior Branch.—The posterior branch takes a direction, in the majority of cases, outward and backward or upward and backward. In a much smaller number of cases it passes directly backward horizontally. Whatever its primary direction, it almost invariably becomes inclined more backward as it progresses, so that, as we follow the course of the vessel, we soon find that in a majority of cases it now becomes directed horizontally backward, in a lesser number upward and backward, and in a few upward. Its final direction when it does not divide into terminal branches is horizontally backward in most cases, though it may sometimes be directed obliquely upward and backward and, exceptionally, downward and backward, in this latter case running on to the occipital bone.

The first part of the posterior branch is located in most cases (seventy-three) upon the temporal bone, but not infrequently upon the sphenoid.

Two general descriptions of the course of the posterior branch will apply to most cases. First, in eighteen cases the artery runs outward and backward along the squamo-petrosal junction or upon the squamous portion of the temporal bone, parallel to the squamo-petrosal junction and usually within one centimetre of it. In these cases the posterior branch generally turns backward above the base of the petrous portion of the temporal bone, crosses the squamo-parietal suture close to its posterior extremity and runs backward on the parietal bone above and parallel to the masto-parietal suture. Second,—and this applies to the majority of the cases,—the posterior branch takes a course approximately parallel to the squamo-parietal suture, or, if it begins low down, parallel at first with the squamo-sphenoidal suture, describing a curve, convex upward and forward, which is generally gentle, but occasionally rather sharp. It lies generally upon the squamous portion of the temporal

bone, and within one centimetre of the squamo-parietal suture in the majority of cases, never being more than two centimetres from it, gradually approaching it, and, unless it divides into its terminal branches on the temporal bone, crossing it generally within two centimetres of its posterior extremity, and passing on to the parietal bone, small branches of it reaching the occipital bone. The posterior branch may, though rarely, pass on to the parietal bone at any part of the squamo-parietal suture.

In fifty-four cases the posterior branch bifurcates into terminal divisions, usually two in number. The point of division occurs on the temporal bone twenty-five times, on the parietal bone twenty-four times, and on the squamo-parietal suture three times. Of the two divisions the inferior is in a great majority of cases horizontal, while the superior is generally directed obliquely upward and backward.

On the parietal bone the posterior branch generally gives off ascending branches, passing either vertically upward or obliquely upward and backward. In several cases two or three vertical branches are given off from a highly placed posterior branch which is directed horizontally backward.

Accessory Posterior Branches.—Accessory posterior branches were found twelve times. Nine of these run upon or near the squamo-petrosal junction, barely reaching the posterior inferior angle of the parietal bone. Three of them cross the squamous portion higher up, but one of them passing off this onto the parietal.

Curves of the Middle Meningeal Artery and its Branches.—I wish here to call attention to the great number of curves present in the course of the middle meningeal artery and its branches; and I shall also go back to the origin of the internal maxillary artery of which the middle meningeal is a branch. I made four examinations of this artery upon three cadavers and found that in each case it was given off from the external carotid almost at a right angle. Examination of the origins of the middle meningeal, in the same subjects, showed that in three cases it arose at a right angle from the internal maxillary, and in one case at an angle slightly greater.

Just after the artery passes through the foramen spinosum it turns outward onto the inner surface of the base of the skull at a right angle. The uniform presence of at least a slight curve in the main trunk, except when this is very short, has already been alluded to. This curve was seen to be so marked as to approximate a right angle in eleven cases, being but a little greater than a right angle in six more. Long main trunks may have a second curve.

The anterior branch is often given off at an angle to the main trunk. This in five cases approximated a right angle. The curve constantly present in the anterior branch on the upper part of the great wing of the sphenoid has been mentioned previously. This approximated a right angle twelve times, was S-shaped once, wave-like once, and of less but varying degrees of acuteness in the remainder of the cases. Additional curves occur irregularly higher up in the course of the anterior branch and its divisions or branches.

The posterior branch is given off from the main trunk at a right angle eight times and at an angle of 135 degrees twice; the angle being less acute in other cases; and we have seen that in most cases it describes a more or less sharp curve on the squamous portion of the temporal bone as it lies parallel with the squamo-parietal or squamo-sphenoidal and squamo-parietal suture.

It will thus be seen that beginning with its origin at the external carotid, the blood-supply to the dura mater traverses constantly three angles which are practically right angles, and that in addition to this it passes at least two curves of greater or less acuteness, one in the main trunk and one in the anterior or posterior branch, before being distributed.

The numerous curves in the arteries supplying the pia mater, the vertebral and internal carotid, and through it the brain substance, have long been noted, and have had ascribed to them the *rôle* of diminishing the velocity of the current of blood, but, so far as I know, the equally pronounced and numerous curves in the artery furnishing the chief supply to the dura mater have never before received especial notice.

Distribution of the Middle Meningeal Artery on the Inner Surface of the Parietal Bone.—The inner surface of the parietal bone is supplied to a slightly greater extent by the anterior than by the posterior branch, so that the line of demarcation between the portions of the bone supplied by each of the branches would be drawn between a point slightly back of the middle of the upper or sagittal border of the bone, and a point somewhat behind the middle of the lower border, or at three centimetres anterior to the posterior extremity of the squamo-parietal suture. From this average, however, there are great deviations, so that in some cases the whole upper border and even part of the posterior border is supplied by the anterior branch, while in others the whole lower border may be supplied by the posterior branch.

The only portion never supplied by the anterior branch is a triangular portion, about three centimetres across, at the posterior inferior angle. The only portion never supplied by the posterior branch, is anterior to a line drawn from the anterior inferior angle to a point on the upper border three centimetres from its anterior extremity.

In by far the greater number of cases the point of demarcation on the upper border lies in the middle third, averaging about its middle on the right side and somewhat posterior to the middle on the left. (See Fig. 1.)

Orbital Branch.—An orbital branch of the middle meningeal artery is described by anatomists as constantly present and passing through the sphenoidal fissure, or a small foramen near it, into the orbit to anastomose with a branch of the lachrymal, which is from the internal carotid through the ophthalmic artery. Upon the skulls, however, I found that in a majority of cases there was no groove present of a sufficient size to be recognizable. I found the groove present in thirty-eight cases, nineteen on each side, but not always on both sides of the same skull. In several cases where no groove could be seen, a small canal was seen running into the orbit, indicating the presence of the orbital branch.

In the cases where the groove was seen, it was designated as being small, of moderate size, and large in about an equal

number of cases on both sides. In about one-third of the cases it originated from the main trunk, in the remainder from the anterior branch. Its origin was generally upon the upper part of the great wing of the sphenoid.

Its location is, with but few exceptions, entirely upon the sphenoid, and its direction forward or forward and upward. I found that it entered the orbit through the sphenoidal fissure seven times, and through a special canal (canalis cranio-orbitalis

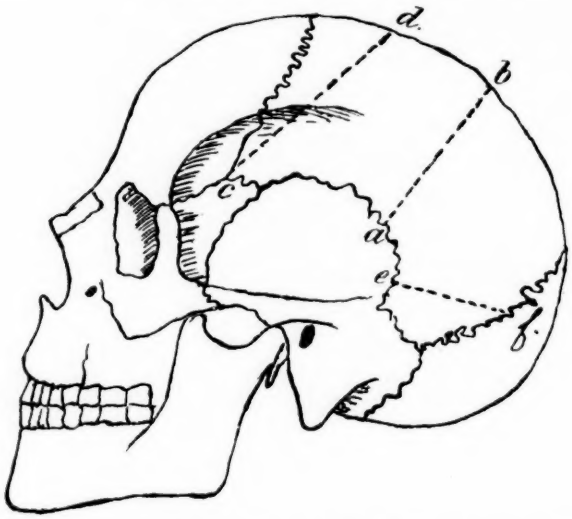

FIG. 1.—Distribution of the anterior and posterior branches on the parietal bone; *a*, *b*, shows the line of demarcation between the portions supplied by the two branches in an average case; *e*, *f*, shows the posterior limit of the portion which may be supplied by the anterior branch; *c*, *d*, shows the anterior limit of the portion which may be supplied by the posterior branch.

of Haller) generally in the great wing of the sphenoid, but sometimes just at the spheno-frontal junction just external to the outer angle of the sphenoidal fissure, thirty-one times. I would not, however, assume from these thirty-eight cases that this was the ratio of the two methods of entering the orbit in all cases, for it may be that, as a rule, the groove for the artery is more pronounced when it passes through a foramen than when through the fissure.

In one skull I found the orbital branch upon the left side of such size and course as to make me regard it as taking the place of the anterior branch of the middle meningeal, and as proceeding from the orbit to the cranial cavity. The branch was of large size and passed out of the orbit through the outer angle of the sphenoidal fissure proceeding thence to the anterior inferior angle of the parietal bone, then upward parallel to and one centimetre behind the coronal suture, giving off branches as the anterior branch ordinarily does. In this case the posterior branch was of average size and distribution, entering the skull through the foramen spinosum and giving off one-half centimetre from the foramen spinosum a very small branch analogous to the anterior branch which passed forward and outward on the temporal bone just behind the squamo-sphenoidal suture for 1.5 centimetres and then became lost. A second very small branch given off from the posterior branch 0.6 centimetre farther on crossed the temporal and sphenoid bones and anastomosed with the orbital branch.

Steiner found in six cases the orbital branch from the lachrymal taking the place of the middle meningeal to a greater extent even than in the case which I have just described; for the posterior branch was smaller than normal in his cases, in some very small and in some entirely wanting, as was also the foramen spinosum.

Arteria Temporalis Accessoria.—This is a rare branch, so named by Krause. It is described as arising either from the main trunk or posterior branch and perforating the squamous portion of the temporal bone about two centimetres below its upper border, making its appearance upon the outer surface of the skull.

Gruber found it twenty-five times in 4000 skulls; Krause observed it in 0.8 per cent. of all the cases examined; Steiner found it in two skulls, it being present on both sides of one of them. I found it in two skulls, being present on both sides of each. In one of them it was given off from the main trunk at the foramen spinosum on both sides, in the other it was given off on the right side from the posterior branch 1.5

centimetres from its origin, and on the left from the external petrosal branch. In each case it entered a small canal 0.3 or 0.4 centimetre below the squamo-parietal suture on the inner surface of the skull, and made its exit on the outer surface at the highest point of the squamo-parietal suture, running upward on the parietal bone.

Symmetry of the Two Sides of the Skull in Regard to the Distribution of the Middle Meningeal Artery.—In almost all of the skulls examined a marked tendency to symmetry between the two sides was noticed in regard to the size, location, direction of the various parts of the artery as well as the arrangement and distribution of its branches. There were found, however, so many exceptions to an exactly symmetrical arrangement, as to show that any inferences as to the arrangement on one side of the skull drawn from one's knowledge of the other side would be very likely to be erroneous.

The Presence of Bony Canals in the Course of the Middle Meningeal Artery.—In sixty cases, thirty on the right side and thirty on the left, but not always on both sides of the same skull, there was present in the course of the anterior branch, in the neighborhood of the anterior inferior angle of the parietal bone, a bony canal through which the anterior branch ran. In twenty-three skulls it was found on both sides. Steiner found this bony canal in thirty-eight cases. Its length varies from 0.3 to 2.8 centimetres, being generally between one and two centimetres.

It is always located on the parietal bone, but in two cases its beginning is upon the sphenoid, soon, however, passing onto the parietal. It begins generally at the spheno-parietal suture, most frequently at its anterior extremity, but sometimes it begins on the parietal, in which case it is, with three exceptions, within one centimetre of the spheno-parietal suture. The greatest height above the suture at which it arises is 1.4 centimetres. Its direction is upward and backward, practically parallel with the coronal suture, its exit being within one centimetre of that suture. Occasionally it bifurcates above. Sometimes it has a small foramen or canal opening into it anteriorly for the passage of the ramus fronto-basilaris.

Sites for Trephining for the Middle Meningeal Artery.—In my study of the sites for trephining, my locations refer to the outer surface of the skull.

The first requisite of a method for locating the site for trephining for a branch of the middle meningeal artery is that it should locate that branch with certainty.

The second is that it should expose the branch sought in the most desirable place.

The third is that it should be as simple as possible.

If it be the anterior branch which we are seeking, three factors have a preponderating influence upon the desirability of the site. These three factors are—

(1) The relation of the site to the bony canal, if the latter is present.

(2) Its relation to the orbital branch.

(3) Its relation to the bony ridge running along the lower part of the coronal suture.

If it be the posterior branch that we seek, the proximity of the lateral sinus is the most important factor for consideration. Of course, no method for locating the main trunk can be expected to reach this with any uniformity, for, when present, it is frequently too short to reach.

If the site for trephining the anterior branch be so located as to strike the artery while it lies in a bony canal, the artery would unavoidably be cut through before the button of bone could be removed, causing hæmorrhage during the process of its removal, and necessitating the enlargement of the opening along the course of the artery before the latter could be secured. Probably plugging the canal with antiseptic wax would control hæmorrhage temporarily after removal of the button. If the location were such as to reach the artery below its orbital branch, ligation of the vessel for the purpose of checking hæmorrhage from a rent in the artery higher up would prove unsuccessful owing to the supply of blood which would be brought from the lachrymal artery through the orbital branch. In case the orbital branch were so large as to constitute the source of the anterior branch, a low site might not reach any portion of the vessel,

which would pass above it. The fact that a given site reaches the orbital branch in a case where this is of average size must not lead one to the conclusion that it would reach this branch in a case where it constituted the source of the anterior branch; for, while in the former case, the orbital branch generally extends in a downward and backward direction from the external angle of the sphenoidal fissure, in the latter it generally extends upward and backward. It is seen, then, that it is desirable to reach the anterior branch at or above the location of the orbital branch.

The Bony Ridge.—Extending outward onto the inner surface of the lateral wall of the skull, from the angle of junction of the great wing of the sphenoid with the orbital plate of the frontal, is a bony ridge, whose formation ordinarily is contributed to about equally by the frontal and parietal bones. On the lateral wall of the skull this ridge is located along the lower portion of the coronal suture. If this ridge is of average length, it inclines at its upper part, backward and upward from the coronal suture, being located, consequently, in this portion, on the parietal bone. Occasionally its lower portion is contributed to more largely by the frontal than by the parietal, but the upper portion, unless the ridge is of less than average length, is composed almost always principally of the parietal. In cases where the great wing of the sphenoid extends high on the side of the skull, it may contribute to the formation of the lower end of the ridge, either forming the whole of this end, or sharing its formation with the frontal.

If the anterior branch of the artery runs in a canal, this canal is generally located in this ridge; only in case where the ridge is short the canal may begin above its upper end. When the canal is in the ridge, it enters it at its posterior border. If there is no canal, the anterior branch lies in a groove, either in the ridge, generally in its posterior part, but occasionally as far forward as its summit, or it lies farther back within a short distance of the posterior margin of the ridge. It is only as a rare exception that the anterior branch is found anterior to the ridge, and even in this case it is anterior to the upper extremity only of

the ridge, having arrived at this situation by passing through the ridge from below, in a canal, or, much more rarely, in a groove. I found the artery anterior to the upper extremity of the ridge four times.

This ridge is of some surgical significance. If the trephine opening is so located as to involve the ridge, the button of bone will be more difficult to remove owing to its greater thickness in the portions of its circumference involving the ridge than elsewhere. If the portions of the ridge involved contains the anterior branch in a canal, this will inevitably be lacerated before the button can be removed.

As a surgical landmark the ridge is of value; for, if the anterior branch be not exposed by an opening involving the ridge, we know that we must seek posteriorly for it, the few exceptions having to do with the upper extremity only of the ridge, and being those rare ones where the anterior branch has passed through the ridge from below and posteriorly.

In Krause's osteoplastic flap operation, of which I shall speak later on, the ridge is cut low down at its junction with the fronto-sphenoidal angle, thus leaving the bony canal, if present, upon the flap.

The Anterior Branch.—The methods for locating the anterior branch which I tested upon the skulls were Vogt's, Witherle's, Krönlein's, Kocher's, Steiner's, and the thumb method. In order that my conclusions as to success or failure of a given method might be of a practical nature, I have not made the test as to whether the artery was found at the exact spot reached by the measurements designated in a given method, but as to whether it would come within the circumference of a one-inch trephine applied with its centre at the indicated point. My method of testing this was to apply the centre of a circular piece of adhesive plaster, one inch in diameter, stained black and having a small perforation in its centre, just at the point indicated. In case the skull is translucent, as it usually is in the neighborhood of the anterior branch, it can easily be seen, by holding it to the light, whether this black disk covers the artery or not. I tested the accuracy of this method by control experiments, in which I

located the site upon the inside of the skull by calipers and drew a circle with a half-inch radius around it, and found the two methods to give identical results. In case the skull is not translucent, and this is the rule with the posterior branch, the site had to be located inside, as just mentioned.

Vogt's Method.—Vogt's method locates the anterior branch at the intersection of a horizontal and a vertical line drawn, the former two fingers'-breadth above the zygoma, the latter a thumb's-breadth posterior to the frontal process of the malar bone. This location would vary, of course, with the breadth of fingers and thumbs of the different persons applying it. Two fingers'-breadth with the writer equals 3.5 centimetres, and a thumb's-breadth equals 2.2 centimetres.

A circle one centimetre in diameter with its centre at the posterior extremity of the spheno-parietal suture would include the great majority of the sites. Vogt's method reaches the anterior branch every time, including the case in which it arises from the orbital branch.

In fifty-eight out of the sixty cases in which a bony canal was present it involved the canal. With very few exceptions it reached the ridge every time, this coming within the anterior segment of the trephine, which latter sometimes reached only the posterior portion of the ridge.

This site also exposes the main trunk seven times, it being in these cases at least 3.7 centimetres long; eight times it reaches the first posterior branch of the anterior branch; six times the orbital branch, and twenty-five times the posterior branch.

Three operations upon the cadaver were made by this method. In two cases the anterior branch was found, and in one not found. In the latter its first posterior branch was exposed. In one case where the anterior branch was reached it was in a canal, in the other case not.

Witherle's Method.—Witherle's method consists of two parts, the first locating the anterior branch at the intersection of a vertical line drawn one and a half inches back of the external angular process of the frontal and a horizontal line drawn one inch above the zygoma (I measured from the upper border of the

zygoma), and the second locating it at the intersection of the same vertical line and a horizontal one drawn one and a half inches above the condyloid process of the inferior maxilla.

My tests refer to the first part only of this method, which reached the anterior branch seventy-four times, including the case in which it arises from the orbital branch; failing to reach it twenty-six times. When not reached, the anterior branch lies anterior to the trephine opening, sometimes barely so, and from this up to a distance of 0.8 centimetre. This method locates the point for the centre of the trephine on the temporal, except in four cases. In twenty-five cases it reached the artery in a bony canal. It generally reaches as far forward as the ridge, which is then at the anterior margin of the trephine opening; but the ridge sometimes escapes anteriorly.

This site also reaches the main trunk twenty-three times; the orbital branch, six times; the first posterior branch of the anterior branch, six times; the posterior branch proper, sixty-three times; and a minor branch twice. In every case where the main trunk was reached the anterior branch was also reached.

In three experiments on the cadaver the anterior branch was found each time. In one the posterior branch also.

Krönlein's Method.[1]—Krönlein's method locates the site for trephining three to four centimetres back of the external angular process of the frontal bone on a line drawn from the supra-orbital border parallel with the "base-line," which is a line from the lower border of the orbit to the centre of the external auditory meatus. In making my tests of this method I used the distance of three centimetres back of the external angular process.

By this method the anterior branch was reached ninety-nine times, including the case where it arises from the orbital branch, escaping in one case just postero-inferiorly. By this method the centre of the trephine is located on the sphenoid in a great majority of cases.

The artery was reached in a bony canal forty-six times. In the remaining cases where a canal is present the site is located beneath it. The ridge was found in the majority of cases to lie

[1] Loc. cit.

across the middle of the trephine site, or just anterior to the middle.

This site also reaches the main trunk twenty times; the orbital branch, sixteen times; the first posterior branch of the anterior branch, seven times; and the posterior branch, thirty-three times.

In one experiment on the cadaver upon the right side the anterior branch was found.

Kocher's Method.—Kocher's method locates the trephine opening immediately above the middle of the zygoma. As he

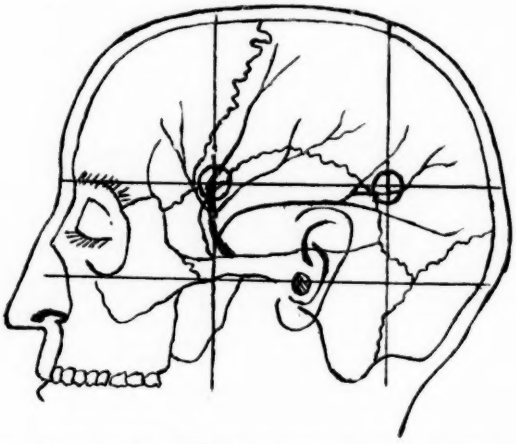

FIG. 2.—Lines used by Krönlein to locate the main branches of the middle meningeal artery. (After Krönlein.)

does not mention the points between which he measures to reach the middle of the upper border of the zygoma, I have made use of the junction of the upper border of the zygomatic process of the malar with the posterior border of the frontal process of the same bone for the anterior point, and the portion of the posterior root of the zygomatic process of the temporal, which is palpable in the living person just in front of the pinna, as the posterior point.

By this method the anterior branch was reached sixty-one times. In the thirty-nine cases in which the anterior branch escaped, the main trunk was reached fourteen times. As it

answers the same purpose, so far as the anterior branch is concerned, to reach either the anterior branch itself or the main trunk, we might add these fourteen cases to the sixty-one and say that, for practical purposes, the anterior branch was reached seventy-five times. Among the twenty-five cases where it escapes absolutely was the one in which it arose from the orbital branch, being one-half centimetre anterior. When the anterior branch is not reached, it lies either anteriorly or antero-superiorly to the trephine opening, being within one-half centimetre of its anterior margin, except in two cases where it is respectively 0.8 and one centimetre anterior.

By this method the centre of the trephine is located upon the squamous portion of the temporal bone, generally between one and two centimetres from the squamo-sphenoidal suture, but sometimes closer to it.

In no case does it reach the anterior branch in a bony canal.

The anterior margin of the opening is between 0.6 and two centimetres posterior to the spheno-frontal angle (or lower end of the ridge). As in all but two of the cases where the anterior branch escapes, it lies within one-half centimetre anteriorly to the trephine opening, and as there is room in every case to move this opening one-half centimetre anteriorly without involving the spheno-frontal angle, I would suggest that this method would be more efficient, if changed so that the location would be immediately above a point one-half centimetre anterior to the middle of the upper border of the zygoma. Possibly this would lessen the number of cases in which the posterior branch is reached, and Kocher intended this method to reach the posterior branch as well as the anterior, he using Vogt's method to locate the anterior branch alone.

This method reaches the posterior branch sixty-six times, and in five of the cases where it fails to reach it, it reaches the main trunk, so that, speaking practically, we might say that the posterior branch was reached seventy-one times.

The main trunk is reached in forty-eight cases, the orbital branch in eight, the first posterior branch of the anterior branch in seven, and the posterior branch in sixty-six, as already stated.

In five operations upon the cadaver by Kocher's method, four on the right side and one on the left, the anterior branch was found in all but one case on the left side, where it lay 0.4 centimetre anterior. The main trunk was reached three times and the posterior branch four times.

Steiner's Method.—Steiner locates the site for the anterior branch as follows: Draw a line from the middle of the glabella

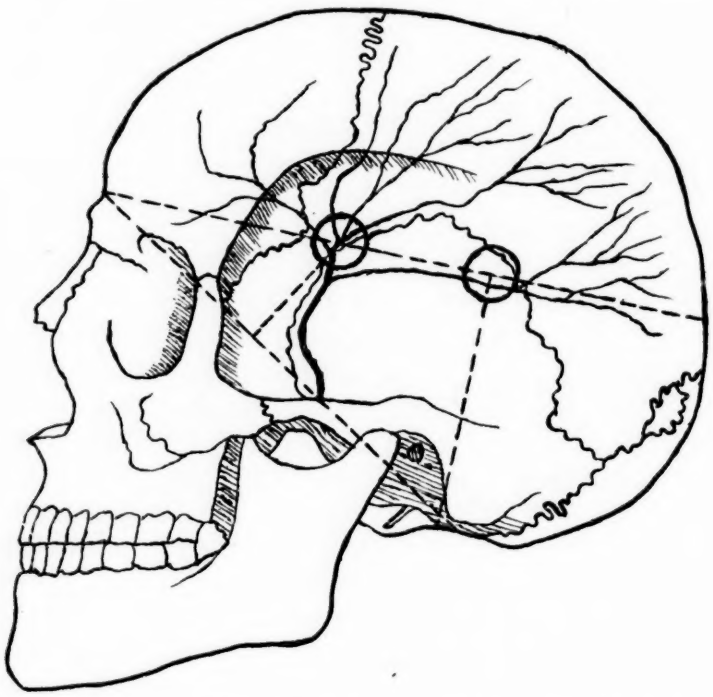

FIG. 3.—Lines used by Steiner to locate the main branches of the middle meningeal artery. (After Steiner.)

to the tip of the mastoid process, and erect upon the middle of this line a perpendicular; where this perpendicular intersects a line passing through the middle of the glabella and extending horizontally around the head, there place the trephine.

By this method the anterior branch is reached ninety-eight times, including the one arising from the orbital branch, passing closely behind the trephine opening in the other two.

It involves the bony canal fifty-six times, being above it in two cases and below it in one. It nearly always involves the ridge, often its thickest part, but occasionally only its insignificant upper extremity. Rarely it lies above the ridge entirely.

It reaches the main trunk three times, none of these three being in the same cases as where the anterior branch failed to be reached. It reaches the orbital branch three times, and the posterior branch ten times.

In four operations upon the cadaver, two on each side, the artery was reached three times, lying 0.2 centimetre posterior to the trephine opening in one case. Of the three cases reached, in two the canal was involved.

Thumb Method.—One of the earlier methods of locating the site for the anterior branch is what I have designated the thumb method, which places the site at the intersection of a vertical and horizontal line, the former drawn the length of the distal phalanx of the thumb back of the external angular process of the frontal bone, the latter drawn the same distance above the upper border of zygoma. The locations, of course, will vary according to the differences in length of the phalanx in the different persons using the method. The writer's distal phalanx measured 3.7 centimetres, or one and a half inches.

By this method the anterior branch was reached in ninety-seven cases, including the case where it arises from the orbital branch. In the three cases where it escaped, it lay closely anteriorly. In none of these three cases was the main trunk reached.

In fifty-five cases the anterior branch was reached while in a bony canal. In nearly every case the ridge was involved, but sometimes only its insignificant upper extremity, while sometimes, though rarely, it escapes anteriorly or inferiorly.

It reaches also the main trunk six times, the orbital branch twice, the first posterior branch of the anterior branch twice, the posterior branch twenty-seven times, and its ascending branch once.

In two operations made on the cadaver the anterior branch was found both times.

TABLE SHOWING COMPARISON OF RESULTS OF THE TESTS OF THE METHODS FOR LOCATING THE TREPHINE SITE FOR THE ANTERIOR BRANCH.

Methods.	Anterior Branch reached.	Main Trunk reached in how many Cases where Anterior Branch escapes.	Total.	Anterior Branch reached in Bony Canal.	Ridge Involved.	When Anterior Branch arises from the Orbital Branch. Reached or not.	Reaches Posterior Branch.
Vogt's	100	. .	100	58	Generally in anterior segment of trephine opening.	Yes.	25
Witherle's . . .	74	. .	74	25	Generally at anterior margin.	Yes.	63
Krönlein's . . .	99	. .	99	46	Generally at middle.	Yes.	33
Kocher's . . .	61	14	75	. .	No.	No.	66
Steiner's	98	. .	98	56	Generally.	Yes.	10
Thumb	97	. .	97	55	Generally.	Yes.	27

Comparison of Methods for reaching the Anterior Branch.— In comparing the results of the tests of the different methods of locating the site for trephining for the anterior branch, we see that in regard to certainty of reaching the artery, Vogt's method leads with 100 per cent. of successes, while Krönlein's, Steiner's, and the thumb method yield but slightly less perfect results. Witherle's and Kocher's methods falling far below. In regard to simplicity, Steiner's method is the most complicated, there being but little choice between the other methods.

In regard to desirability, Vogt's, Steiner's, and the thumb method involve the bony canal and the ridge with practically the same frequency, and each one reaches the anterior branch in the single case in which it originated from the orbital branch, leaving little choice between them. Krönlein's involves the bony canal less frequently, Witherle's still less frequently, and Kocher's not at all, the latter being the only method in which the ridge is not involved as a rule, and the only one not reaching the anterior branch from the orbital. The posterior branch is reached most frequently by Kocher's and Witherle's, while of the remaining

methods Krönlein's leads in this respect. Vogt's and the thumb method have the disadvantage of being variable according to the size of the fingers and thumbs of persons applying them. The one case where the anterior branch arises from the orbital branch affords an insufficient test as to whether the artery thus arising would be found by the various methods in a series of cases, but I would expect that Kocher's method would always fail to reach it, that Witherle's generally would, while the other methods would probably reach it in most instances.

Taken all in all, I think we must select Krönlein's method as the most advantageous. It is not variable, is practically certain to reach the artery, involves the bony canal less often than the other methods approaching it in accuracy, is just as likely as any to reach an anterior branch derived from an orbital branch, and reaches the posterior branch oftener than other methods equally accurate.

Other Possible Methods for locating the Anterior Branch.— Before leaving the subject of the anterior branch, I would call attention to the fact that I have shown that in every case the anterior branch crosses, or lies upon the spheno-parietal suture; that the suture is from one to 1.5 centimetres long, and consequently the anterior branch must be in every case within 1.5 centimetres of the internal aspect of the lower extremity of the coronal suture. As the external aspect of this suture is from one-half to one centimetre anterior to the internal, owing to the overlapping of the parietal bone, the anterior branch will lie farther from the lower end of the coronal suture on the external aspect of the skull, but the most posteriorly located anterior branch will be but 2.5 centimetres (one inch) back of the coronal suture as seen on the outer surface of the skull. It follows, then, that every anterior branch would fall within the circumference of a one-inch (2.5 centimetres) trephine applied with its centre on a level with the lower end of the coronal suture and its anterior margin immediately back of this point.

Unfortunately, this fact is principally of theoretical value, for the sutures are often hard to identify, even when seen, and the lower end of the coronal suture is frequently found obliterated.

Even if used, this method would probably be in no way superior to Krönlein's, and no method can be considered practical which does not measure from palpable points upon the skull.

Again, we saw that the anterior branch crossed a horizontal line drawn backward from the lower extremity of the external angular process of the frontal bone between 1.7 and 3.7 centimetres posterior to that process. Here, again, we have at hand a method for locating the anterior branch, for a one-inch (2.5 centimetres) trephine applied with its centre 2.7 centimetres back of the process would reach the artery in every case and leave a little room to spare both anteriorly and posteriorly. But here again arises the difficulty of locating our bony point, for the external angular process of the frontal is smoothly continuous with the frontal process of the malar bone, and cannot be distinguished through the skin. Eight-tenths to 1.5 centimetres downward and backward from the lower end of the external angular process of the frontal is the prominent angle on the posterior border of the frontal process of the malar bone. The position of the external angular process might be located from this, but this would lessen the simplicity of the method, which, at any rate, would be practically identical with Krönlein's. Consequently, I refrain from adding these two to the already too great number of methods for locating the anterior branch.

The Posterior Branch.—The methods for locating the posterior branch which I tested upon the skulls were Krönlein's and Steiner's.

Krönlein's Method.—Krönlein's method for locating the posterior branch places the site for trephining at the intersection of a line drawn from the supra-orbital border parallel with the "base-line," previously mentioned, and a line drawn vertically from the posterior border of the mastoid process. The horizontal line is the same as that on which Krönlein locates the anterior branch.

By this method the posterior branch is found in forty-one cases. The location of the site is on the parietal bone within 2.5 centimetres of the squamo-parietal suture ninety times, on the squamo-parietal suture within 2.7 centimetres of its

posterior extremity eight times, and on the squamous portion of the temporal within 0.8 centimetre of the squamo-parietal suture twice.

In the fifty-nine cases in which the posterior branch escapes, both its divisions are exposed in nine. As this is equivalent to reaching the posterior branch itself, we may say that the method reaches that branch in 50 per cent. of all cases. In the fifty cases in which neither the posterior branch nor both of its divisions is reached, the inferior division is reached in twenty-five, the superior division in four, and a minor branch in nine. In seven cases the accessory posterior branch of the main trunk is found.

In twenty-six cases the lower margin of the trephine opening overlaps the groove for the lateral sinus. In the remaining seventy-four cases the margin of the trephine opening comes within one centimetre of the lateral sinus in forty-six cases and within one-half centimetre of it in twenty-one of these. As the sinus, when distended with blood, extends beyond the limits of the groove on the bone, these latter locations are dangerously near it.

Steiner's Method.—Steiner's method for locating the posterior branch places the site at the intersection of a line passing through the middle of the glabella and extending horizontally around the head,—that is, the same line on which the anterior branch is located, and a line drawn vertically immediately in front of the mastoid process, turning forward the pinna in order to draw it.

By this method the posterior branch is found in thirty-six cases. The location of the trephine site is on the squamo-parietal suture, three times, or within two centimetres of it, generally within one centimetre of it, on the parietal bone thirty-one times and on the temporal forty-six times.

In five of the sixty-four cases in which the posterior branch was not found both its divisions were reached, and as this is equivalent to securing the posterior branch itself, we may say for practical purposes that this method reaches the posterior branch forty-one times. In the fifty-nine cases in which neither

the posterior branch nor both of its divisions were reached, the superior division is reached nine times, the inferior four times, and a minor branch ten times, while the accessory posterior branch of the main trunk was reached twice, a branch of the anterior branch, either its posterior division or its first or second posterior branch fifteen times, and the anterior branch itself three times

In no case is the groove for the lateral sinus involved, but in one case the edge of the trephine opening just reached to the margin of this groove. In two more cases it reached within a half centimetre of it, and in two more within one centimetre of it.

In three operations on the cadaver by this method the posterior branch was found once.

Comparison of Methods for reaching the Posterior Branch.— The methods for locating the posterior branch are much less satisfactory in their results than those for the anterior, reaching this branch even less frequently than it is reached by Kocher's or Witherle's methods, which are designed for reaching the anterior branch, the latter being intended exclusively for the anterior. The two methods locate the site on the parietal bone in 90 and 31 per cent. of cases respectively, and as we have seen that the posterior branch divides on the temporal bone and squamo-parietal suture twenty-eight times, we see at once the necessity of failure in a considerable number of cases.

I do not believe that any method can be devised which will not fail to reach the posterior branch in a large percentage of cases, owing to the great differences in its course; but a site lower down, nearer its origin, will reach the posterior branch more frequently than either of the methods given.

In regard to the two methods I have tested, the choice must fall upon Steiner's, although it does not reach the artery as frequently as Krönlein's, the fact that the latter involves the lateral sinus in a considerable percentage of cases positively contra-indicating its employment.

TABLE SHOWING COMPARISON OF THE RESULTS OF THE TESTS OF THE METHODS FOR LOCATING THE TREPHINE SITE FOR THE POSTERIOR BRANCH.

Method.	Posterior Branch reached.	Both Divisions reached.	Total.	Involves Lateral Sinus.
Krönlein's	41	9	50	26
Steiner's	36	5	41	0

Hartley-Krause Osteoplastic Flap.—There remains yet to be mentioned another method of reaching the various portions of the middle meningeal artery,—namely, the turning down of an osteoplastic flap in the same manner that Hartley and Krause devised for reaching and removing the Gasserian ganglion.

I did not make any tests of this method upon the dry skulls, but I have performed the operation nine times upon the cadaver, using Krause's flap. In every case the main trunk and anterior and posterior branches were accessible, and in four the orbital branches were also found. In six cases the artery ran in a canal and was unavoidably ruptured in turning down the flap. This is not a serious matter, as immediately after the rupture the whole field is so exposed that the end of the ruptured vessel can be caught at once. The artery in every case remained adherent to the dura mater, pulling out of the canal in the bone. In one case where the canal extended higher than usual it was cut off in the upper transverse portion of the bone incision, and in two cases the artery was very close behind the anterior portion of the bone incision.

Krause's description of the flap is as follows: "The pedicle of the flap lies above the zygoma. The incision extends from just in front of the tragus upward, bowing out convexly backward and then describing a semicircular bow forward in such a manner as to be convex also anteriorly, and ending at the malar bone, so that the base of this uterus-shaped flap is 3.3 centimetres, its height 6.5 centimetres, and its greatest breadth above 5.3 centimetres."

Hartley[1] describes his incision as omega-shaped, having its base at the zygoma, and measuring a distance marked by a line drawn from the external angular process of the frontal to the tragus. The curved and rounded portion of the incision reached as high as the supratemporal ridge; the whole flap approximating in size a circle three inches in diameter.

I regard the osteoplastic flap as the ideal method of reaching the middle meningeal artery, for by it the removal of the clot, which is generally present when this operation is done, is facilitated, and the artery can be ligated in the most desirable location even down to the foramen spinosum, if necessary, as all the important portions of it and its communicating branches are freely exposed. So important does Steiner regard this method as to state that we now have no use for the more-defined locations of other methods except where some contra-indication to the formation of a flap is present. These contra-indications he named as the presence of a compound fracture, or great injury to the soft parts, each of which would threaten the nutrition of the bone-flap. If, however, this method should be adopted by surgeons, I doubt whether these contra-indications would always have to be considered as absolute, for such large areas of bone, which has been entirely detached, have been implanted with success, that doubtless this bone-flap would grow in spite of considerable injury to the adjacent soft parts.

Relations of Middle Meningeal Artery to the Trephine Site used in Rose's Operation for reaching the Gasserian Ganglion.— In Rose's operation for removal of the Gasserian ganglion a trephine opening is made in the great wing of the sphenoid a little anterior and external to the foramen ovale, the edge of the trephine just impinging on the edge of the foramen. I tested the frequency with which the middle meningeal artery would be involved in this operation, using a two-centimetre trephine as recommended by Professor Edmund Andrews. I found that the main trunk was involved twenty-six times and the anterior branch twelve times, showing the necessity of securing extracranially

[1] Intracranial Neurectomy of the Fifth Nerve, ANNALS OF SURGERY, 1893, XVII, 511–526.

either the middle meningeal, or else the internal maxillary in such a way as to control the middle meningeal. It must be remembered that the middle meningeal is the first branch of the internal maxillary and lies well back, so that, although the ligation of the internal maxillary is a routine proceeding in the operation, it might be ligated anteriorly to the origin of the middle meningeal, unless the latter is borne in mind.

Conclusions.

From the results of my researches, I think we are justified in drawing the following conclusions:

(1) That the course and distribution of the middle meningeal artery are subject to wide variations.

(2) That after the artery leaves the foramen spinosum there is no location at which a portion of the main trunk or one of its terminal branches has a constant and defined position, except where the anterior branch crosses the spheno-parietal suture on to the anterior inferior angle of the parietal bone.

(3) That a trephine opening one inch in diameter made immediately back of any portion of the coronal suture will almost invariably reach the anterior branch or a branch from it.

(4) That in a great majority of cases there is a main trunk of the artery within the cranium.

(5) That the anterior branch may be derived from the orbital branch of the lachrymal branch of the ophthalmic.

(6) That the parietal bone is supplied to slightly greater extent by the anterior than by the posterior branch.

(7) That the blood-supply to the dura mater traverses as many and as pronounced curves as that to the pia mater.

(8) That while there is a tendency to symmetrical arrangement on the two sides of a given skull, the exceptions to this are so numerous that we can make no practical use of this symmetry.

(9) That in a majority of cases the anterior branch is inclosed in a canal at the anterior inferior angle of the parietal bone.

(10) That, in locating the anterior branch, that site is

most advantageous which reaches it high enough to prevent its escaping in case it originates from the orbital branch, and to expose or lie above the orbital branch when it exists merely as a communicating branch ; and which involves the bony canal and the ridge along the lower end of the coronal suture least frequently.

(11) That for locating the anterior branch, Krönlein's method is the most advantageous.

(12) That no method will locate the posterior branch with much certainty.

(13) That in locating the posterior branch one must carefully avoid the region of the lateral sinus.

(14) That Steiner's method is the most advantageous for locating the posterior branch.

(15) That we have in the Hartley-Krause osteoplastic flap the only method fulfilling all the requirements for an ideal exposure of the middle meningeal and its branches.

(16) That shutting off the circulation of the middle meningeal extracranially is an essential step in the performance of Rose's operation for the removal of the Gasserian ganglion.

AN INTRACRANIAL IMPLANTATION DERMOID TUMOR.[1]

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MRS. T., forty-six years of age, was admitted to the Roosevelt Hospital August 13, 1894, stating that she had always enjoyed good health. Ten years before she struck her forehead a severe blow against the corner of a door, at which time she noticed that the region of the injury was painful upon pressure, with a slight cut in the skin, beneath which there seemed to be a small hole in the bone large enough to admit the tip of the finger.

The cut healed, and though the depression could be felt for a long time, it was subsequently, at the end of two years, followed by a prominence or swelling at the spot where formerly the depression existed. This swelling had never been painful except upon deep pressure, nor had she suffered from this injury, unless her occasional headaches be looked upon as symptomatic.

The examination of the patient showed her to be a robust and healthy woman. Upon the forehead, just to the left of the median line, was a tumor one and a half inches in diameter and elevated about half an inch. The tumor was elastic, smooth, and circumscribed. It was not adherent to the overlying skin. On deep pressure there seemed to be an irregular opening in the bone following irregularly the outline of the tumor. The edge of the opening was sharp and irregular. No pulsation could be obtained in the tumor.

On August 17, under ether, I made an omega incision with the base above the tumor. The flap was dissected up, including the skin and subcutaneous tissue.

Beneath this flap was a layer of tissue apparently continuous with

[1] Read before the New York Surgical Society, February 26, 1896.

the periosteum at the margin of the tumor. It was not adherent to the skin except opposite the centre of the flap raised. It was bluish in color and bulged distinctly forward. This layer was divided along its edge and removed, exposing an irregularly-rounded opening in the frontal bone. Behind this opening could be seen a mass of soft gelatinous material covered by a very thin capsule, which was continuous with the layer above, as well as with the dura mater upon the bony margin. The soft gelatinous material was removed with a spoon and sponge, leaving a cavity which extended backward (a little farther upon the roof than upon the floor of the skull) for about two inches. The upper boundary consisted of the vault of the skull covered by the dura. The posterior boundary, a sloping one, consisted apparently of the normal pia pushed back by the growth. The inferior boundary was the horizontal plate of the frontal bone, in which there was a funnel-shaped opening leading into the frontal sinus. The anterior limit of the tumor was the irregular and thin opening in the vertical plate of the frontal bone, one and a half inches in diameter. The pia mater at the back of the cavity laid in loose folds. During the operation it could be noticed that the brain was expanding very slowly and loosening the folds in the pia mater. The edge of the bone was trimmed so as to present an even margin. The capsule, so far as it could be recognized, was removed. The cavity was loosely packed with sterile gauze. The skin-flap was brought down and sutured with catgut along its sides, the tip being left open to remove the packing. Aseptic dressings were then applied.

The contents of the cavity consisted of a whitish-gray matter, arranged in concentric layers and in spheroidal form, each of about the consistency and thickness of heavy paper. At the centre of this globular mass was a ball, half an inch in diameter, of a dark-brown material of the consistency of oatmeal. The entire mass formed a sphere of a semisolid matter, breaking up readily under the instruments.

August 22. The cavity was still clean. The brain had advanced considerably.

August 29. Cavity was filled up about one-third by the advance of the brain.

September 1. Cavity was granulating and becoming smaller.

September 26. Cavity was slowly closing. It was lined with granulations, which gave rise to a slight discharge.

There had been no infection during the treatment.

September 27. She was discharged with a small opening and referred to the Out-Patient Department for further treatment.

The microscopical examination made by Dr. Ewing, of Roosevelt Hospital, showed that the capsule was a modified form of skin. In a few places the epidermis was composed of the usual number of epithelial cells of normal size, among which the prickle-cells of the Malpighian layer were positively identified. At other points the epithelial layer consisted of only two or three thinly-flattened cells, or was reduced to a homogeneous, highly refractive line resembling the stratum lucidum of the epidermis. Everywhere the innermost rows of cells presented the translucent appearance of the stratum corneum. No trace of dermal papillæ could be found. No hair follicles, nor sebaceous nor sudoriparous glands were present to account for the large mass of sebaceous matter constituting the body of the tumor. At one edge of the capsule, beneath the epidermic layer, were a number of trabeculæ of bone. These were surrounded by a layer of osteoblasts, suggesting the development of bone in the fœtal skull. The centre of these trabeculæ failed to stain with hæmatoxylon or eosin, and were, therefore, not ossified.

A few rather large nerve-trunks and blood-vessels, several lobules of fat, and a thick and dense layer of connective tissue uniting the capsule with the scalp completed the section of the tissue which might properly be considered the capsule of the cyst.

The body of the tumor consisted of a central necrotic area of fatty matter, showing large cholesterin crystals embedded in a matrix of disorganized granular matter, staining deep red with eosin. Towards the periphery the contents of the cyst assumed a more or less lamellar arrangement, and here and there the layers, whose gross appearance was of wax, proved to be, on section, unaltered fat. A fine granular coagulum spread in a net-work through the fat and gave the mass the appearance of fat-tissue.

The question naturally arises as to whether this is not a dermoidal tumor, and we must answer it in the affirmative, but only in so far as we mean by that term such tumors as are in general furnished with skin or mucous membrane, and occur in situations where these structures are not found under normal conditions. To be more precise, congenital dermoidal tumors include tubulo-dermoids, ovarian dermoids, dermoidal patches, and sequestration dermoids. In this situation we would have

only to deal with those tumors arising in detached portions of surface epithelium in situations where, during embryonic life, coalescence between skin-covered surfaces takes place,—*i.e.*, the sequestration dermoid.

In this situation the congenital dermoid occurs either in the orbito-nasal fissure or as a dermoid of the scalp. In the orbito-nasal fissure, these tumors occur in three different situations:

(1) At the outer angle of the orbit, in close relation with the pericranium, covering the frontal bone in the immediate neighborhood of the external angular process.

(2) At the inner angle of the orbit, where they are less frequently seen. They have the same intimate relation with the dura as in other varieties in this situation.

(3) In the upper eyelid, between the fronto-nasal plate and the cutaneous fold, from which the eyelid is formed. In the lower segment of this fissure the dermoids occupy the naso-facial sulcus.

At the root of the nose, over the fontanelles, at the occipital protuberance, and less frequently in other portions of the scalp, dermoids are also found. Here they are frequently attached to the dura mater by a pedicle which traverses a hole in the underlying bone, unless it be over a fontanelle. In the occipital region, dermoids may lie beneath the occipital bone in close relation to the tentorium cerebelli.

The origin of these tumors is based upon the fact that in embryonic life the dura and skin are in contact. On the base and side walls the membranous cranium gradually chondrifies and a separation between the dura and skin takes place. On the vault bone itself develops between the dura and the skin, except over the anterior fontanelle, along the sutures and over the torcular. If an imperfect separation of the skin from the dura takes place, the permanent adherence will give rise to a dermoidal tumor. Such a tumor may remain attached to the dura with the bulk of the mass situated in a shallow depression of bone, the centre of which depression represents the point of adhesion to the dura. In other cases a pedicle surrounded by bone serves to show the connection with the dura. This same variety may undergo a

still further modification in that the growing bone separates the tumor from the skin, and the future development of the mass takes place beneath the bone and outside the dura mater. In this class of dermoids microscopical examination has shown a cyst wall analogous to the skin, with its epidermis, its corium, its sebaceous glands, and hair-follicles. The contents of the cyst have been found to be a white or yellow and fatty material mingled with hairs and sometimes containing cartilage or bone. On the contrary, in this case, we find no trace of papillæ, no hair-follicles, no sebaceous glands. The bone present in the cyst wall is a part of the frontal taken away with the cyst wall in order to obtain a complete view of the tumor.

Can this growth be classed as that variety of dermoid or atheroma which is now classed as cholesteatoma or pearl tumor, and is considered as endothelioma (Chiari, Eppinger, and Eberth) originating in the endothelium of the vessels the periepithelium of their sheaths or from that of the lymphatics? The contents of these tumors are either fat, cholesterin, or pearl-like masses of cells. Under the name of cholesteatoma or pearl tumors they have been found in the pia mater, mastoid antrum, parotid and thyroid glands, in the testicle, ovary, kidney, and tonsil, or as a part of other tumors. To me it seems scarcely probable that this tumor can be classed as an endothelioma. It seems improbable that the mutability of the endothelial cells could be so complete as to leave no trace of their existence, and to produce a cyst wall so distinctly epidermal in its character and structure.

The third variety of tumor, to which, I think, this may belong, is the implantation cysts,—*i.e.*, tumors caused by the accidental transplantation of a portion of the surface epithelium or the hair-bulbs into the underlying connective tissue. These have been described as sebaceous or dermal cysts as well as dermoids. They should form, however, a distinct group of themselves. They occur most frequently upon the fingers of shoemakers, carpenters, and tailors. M. Muron (1868) was the first to describe them, although he did not associate an injury as

being the cause. He mentions, however, their occurrence in working-people. Reverdin, Garré, Franke, and Blumberg have reported cases occurring in the hands, and many ophthalmologists have seen them in the eye. In these cases the tumors have been either cystic or solid, and their appearance has been that of mother-of-pearl. They have been surrounded by a connective tissue capsule, the inner surface of which has been covered with epithelium. The cavity has been in most instances filled with epithelium arranged in concentric layers with cholesterin crystals and fat. Sudoriparous and sebaceous glands have not been present.

Weil and Wernher have classed them as dermoids. Graefe has described them in the eye as intra-ocular cysts dependent upon an implantation of epidermis within the ocular tissue as the result of injury. Buhl and Rothmund have classed them as implantation cysts. Collins has named them epithelial cysts—false cysts—in contradistinction to true or endothelial cysts. Blumberg considers these intra-ocular tumors, epithelial cysts, the etiology, the macroscopical and microscopical characters of which he maintains are the same as those in the palm of the hand. Experimental work upon the eye has pretty definitely settled the fact that the solid tumors (pearl tumors) and the serous cysts have no fundamental but only a gradual difference in structure.

In order to substantiate this theory of the origin of such tumors, Kaufmann marked off upon a cock's comb, by an oval or rounded incision, a piece of the comb which he sank in the tissue by uniting the line of incision. After some time he found closed cysts, the contents of which consisted of epithelial cells arranged in concentric layers. Garré, as well as Kaufmann, supposed that these pieces of skin transplanted in the tissue required to remain in connection with the mother tissue in order to form new epithelium. In the intra-ocular cysts and tumors this has been shown not to be a prerequisite. Both pieces of the lids and the mucous membrane of the lip have grown when transplanted within the eye.

Monoyer and Cornil and Ranvier maintain that the pearl tumors of the brain are similar to the epithelial tumors of the

hand and eye. They class what has been formerly called " Cystes Epidermiques des Doigts," " Die traumatische Epithel Cysten der Fingers," the dermoid and atheroma of the vola manus the same as these pearl tumors.

Treves has reported such a tumor in the scalp in a woman twenty-nine years of age. It was situated over the external occipital protuberance. It measured seven centimetres in diameter. It was cystic with walls lined internally with skin furnished with hair five or eight centimetres long. The cavity contained sebaceous matter and mucus-like fluid. The patient affirmed that the tumor appeared after a lacerated wound of the scalp eight years ago. The scar was still evident, and Treves reports it as an implantation cyst resulting from this injury. Etiologically the views are somewhat different, since many maintain that they are alone derivable from epithelium, and a few believe that they may originate from either endo- or epithelium. On the other hand, otologists place what they call cholesteatoma in a class by itself, giving as an example the fact that in the ear, without suppuration, the desquamated epithelium may collect in masses, dry, and by irritation to the mucosa, lead to a proliferation of the epithelium, which compassed in concentric layers forms a tumor.

Franke and Labougle maintain that trauma acts as a cause in only a small proportion of cases.

Labougle, in forty-two cases in which this variety of tumor was present in the vola manus, found that in sixteen trauma existed in a causative relation. In the remaining twenty-six cases he thinks that embryological-cell masses destined for the formation of the epidermis became separated at the interdigital folds, and maintaining a vegetative activity of their own, give rise by irritations, such as trauma, to epithelial tumors.

Franke does not believe that this view will hold good for other portions of the body. He would explain their origin either by a separation of the epithelium destined to become glands and their remaining so until in extra-uterine life they form tumors of themselves, or by trauma in extra-uterine life portions of the epidermis or of the glands became separated and subsequently developed to cysts or pearl tumors.

These tumors derived from portions of the epidermis and with a capsule composed alone of epidermis are called by Franke epidermoids, whereas, those in which the wall consists of the epidermis and glandular appendages are classed as dermoids. Briggs, of Boston, who reports a case in the finger, says, "One theory is that these cysts are true dermoid, and that in the cases where they occur there was an embryonic inclusion at this point. But they have never yet been found in children and seldom at puberty. They usually occur in adults. No case has been reported containing hair, teeth, nails, or other of the contents found in dermoid cysts. Plastic heterotopia, or formation of tissue in unusual places, has also been advocated as the explanation. It seems to me that this is not an explanation.

"It is a noteworthy fact that in all cases the cyst follows an injury of the affected finger. It is also to be noted that the wall of this cyst is skin-like in structure. These two facts have led to the belief, in which the writer concurs, that these cysts are due to preceding injury in which a fragment of skin is forced in and transplanted subcutaneously."

A fragment of skin may be very frequently carried in at the time of the injury, but it is almost invariably either killed by the injury or is disposed of in the healing process. But, once in a great many thousand times, this fragment retains its vitality, becomes engrafted on the subcutaneous tissues, and after a dormant period of, usually from four months to two years, the cyst develops.

The consensus of opinion of those who have done the most work in this class of growths seems to be in favor of placing some of the pearl tumors, the cholesteatomata, and the epithelial tumors, of the variety here described, in the same group, believing that the location, the duration of their existence, and the greater or less vascularity of the part so influences their growth that at one time they appear solid and at another time cystic.

The tumor presented in this paper is, in my mind, one of this latter variety due to the trauma which occurred ten years previous to her admission, at which time she was thirty-six years of age, and had never noticed anything suggesting trouble with

her head. I believe that the injury resulted in a compound, depressed fracture of the skull of small extent, and the implantation of either the epidermis or of the glandular appendages to the skin in the tissue beneath the bone and dura mater, or between the bone and dura mater. The subsequent growth of the tumor showed no malignancy but displaced tissues by its pressure until, at the end of ten years, it arrived at the size mentioned. From the history of the case and the microscopic examination it appears more probable to me that this tumor should be classed as an implantation dermoid due to the trauma, rather than to blindly accept the idea that the trauma awakened the growth of a congenital or sequestration dermoid.

CASE OF OPERATIVE INJURY TO THE THORACIC DUCT AT THE ROOT OF THE NECK.

By J. SCHWINN, M.D.,

OF WHEELING, W. VA.

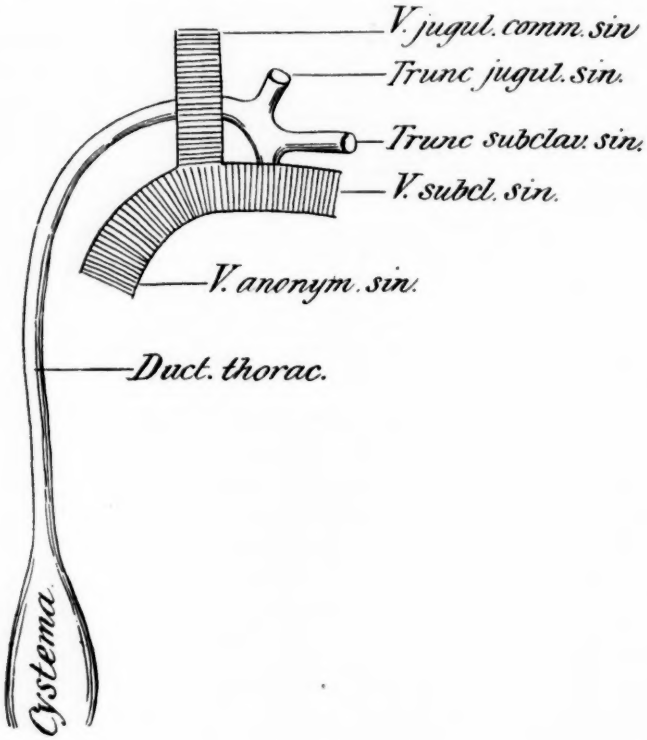
INJURIES to the thoracic duct during operations on the deep structures of the neck are sufficiently rare and of such frightful importance, when they do occur, that the report of the following case may not be altogether without interest.

A. F., aged twenty-five years, and otherwise apparently healthy, consulted me on December 15, 1895, about a bunch of tubercular glands on the left side of his neck. Most of the glands, superficial and deep, from the mastoid region down to the clavicle seemed to be affected, and as the man had gone through several courses of treatment at the hands of other physicians, I advised removal. This proposition accepted, the glands were removed in one bunch, together with their lymph-vessels through an incision from below the mastoid process down to an inch above the sterno-clavicular joints, dividing the sterno-clavicular muscle. The enucleation was easy with the exception of a number of glands matted together by periadenitic bands, and adherent to the sheath of the deep vessels. Right above the sternal end of the clavicle there were two rather large glands which I enucleated with the finger and without the use of any instrument whatever. During the whole operation there was not the slightest indication of anything going wrong and the wound healed in its whole length by first intention. On the tenth day after the operation I noticed a slight swelling over the left sterno-clavicular region, but as there was neither fever nor pain present, I did not pay much attention to the matter. Two days later, on the twelfth day after the operation, the swelling had increased to the size of a small hen's egg, and there was decided fluctuation. On opening the lower angle of the incision with a probe there came gushing forth a liquid looking

very much like skimmed milk, and showing under the microscope all the characteristics of chyle; the fluid at this first time amounted to about one and a half ounces. I then fixed a compressing dressing over the lower part of the original wound and waited two days, when I again found about two ounces of chyle collected in a sort of cavity at the lower end. This cavity was now packed with iodoform gauze in the hope that this would stop the flow; but to my great surprise I found that it made matters much worse, the quantity of chyle discharged during the twenty-four hours amounting now to at least one and a half to two pints. This heavy loss of nutrient material soon told on the general health of the patient, as in the course of a few days he lost flesh, grew weak, had severe anæmic headaches, and several attacks of syncope. His pulse was small, quick, and easily compressed. He suffered intense thirst, which could only be partly gratified as the ingestion of fluids into the stomach was followed very promptly by an increased flow of chyle. As all the remedies so far used to stop this flow proved of no avail, I took the patient back to the hospital, opened up the lower part of the original incision, and without much difficulty found the leaking point in the form of a small vessel torn through, the free opening being about the size of a knitting-needle. On account of the deep situation of this vessel ligature would have been rather difficult, and I therefore put a clamp on and packed the cavity around this with gauze. A few hours after this procedure the patient expressed himself as feeling better, his pulse grew stronger, and the clamp having come off on the third day, he made a complete recovery.

This case differs from all the cases of a similar nature so far reported, in the fact that the flow of chyle did not begin during or shortly after the operation, and, furthermore, in the fact that the gauze tampon, instead of stopping or diminishing the flow, made it much worse, so much so that I was under the impression that the main duct had been wounded. These two rather unusual occurrences can, according to my understanding, be explained only in the following way: During the enucleation of the two lower glands, one of the larger branches of the thoracic duct, probably the truncated jugular sinus, had been torn through very near its connection with the main duct. During and shortly after the operation, the walls of this vessel being curled in, the

escape of chyle was prevented. But when the *vis a tergo* from the main duct came into play, the obstacle was removed and there was a slight flow, corresponding to the size of the vessel and the pressure resting on it from the overlying skin and dressing, the flow at that time amounting to about one-half ounce in the twenty-four hours. As soon as the gauze tampon was introduced right to the open mouth of the torn vessel the chyle was



drained away from the main duct in much larger quantities, so much so as to leave the impression as if the main duct itself had been wounded. A practical deduction from my experience in this case would seem to be the advice not to enucleate the lower glands without at the same time putting a ligature around their lymph-vessels.

A CASE OF SARCOMA OF THE TONGUE.

By GEORGE WILLIAM PERKINS, M.D.,

OF OGDEN, UTAH,

SURGEON TO THE UNION PACIFIC RAILWAY HOSPITAL.

SARCOMATOUS disease of the tongue is an affection of such infrequent occurrence that but few surgeons have encountered a case in the experience of a lifetime. Standard surgical text-books either ignore the disease altogether or dismiss it in a line or two, like "The tongue is at times the seat of sarcoma," "Sarcomata of the tongue are almost unknown as primary growths," etc. Senn[1] says, "Butlin regards sarcoma of the tongue as an exceedingly rare affection. Mr. Targett reports a case in which, in a patient twenty-five years of age, a sarcoma developed on the under portion of the left side of the tongue, involving at the same time the floor of the mouth. The tumor appeared as a hard, painless mass, and the mucous membrane over it was not ulcerated. It was removed through an incision of the cheek extending in a backward direction from the left angle of the mouth. Examination of sections of the tumor under the microscope showed it to be a round-celled sarcoma. In fifteen months it returned in the left submaxillary region and below the zygoma of the right side. Mr. Targett gives the history of two additional cases which occurred in Guy's Hospital."

It would therefore appear that a case of this disease is to be regarded as a surgical curiosity, and as such, if for no other reason, it is worthy of record in surgical literature.

My patient first consulted me on January 7, 1894, and his history is as follows: P. J., male, aged twenty-six years; a Dane; married; laborer. Family history negative.

[1] Pathology and Treatment of Tumors.

Personal History.—He always has had excellent general health. When he was four years old there was first noticed a pin-head sized growth projecting on the upper surface of the tongue near its centre; this slowly increased in size until he was twelve years old, when it had attained about the size of an English walnut, and occupied the central portion of the tongue, being visible both on the dorsal and inferior surfaces, where it projected beneath the mucous membrane. From about the age of seven or eight up to twelve the growth was occasionally painted with some preparation of iodine. After the twelfth year it apparently ceased to grow and remained of the same size, approximately that of an English walnut, until his twenty-fifth year.

During the first twenty years of its existence it produced no symptoms, and caused him no discomfort or inconvenience whatever, and he hardly realized its presence. Shortly after he was twenty-five years old the lower and anterior portion of the tumor began to increase rapidly in size, and soon bulged out considerably from the under surface of the right anterior part of the tongue; but that portion on the dorsal surface and central part of the tongue apparently remained of the same size and prominence that it had attained when he was twelve years old. This sudden increase in growth caused him to consult a physician, who, in October, 1892, removed from the lower surface of the right side a firm, almost perfectly round mass of about the size of a black walnut. The wound healed in three weeks, during which time he had chills and a high temperature.

About a year after he again noticed that the growth was increasing in size and projecting from the under surface of the tongue to the left of the site of the operation scar. The whole mass now grew very rapidly, and enlarged the entire tongue to such an extent that it began to interfere seriously with his speech and swallowing, and with his respiration during sleep. It, however, caused him no pain, and, except for the inconvenience of its size and the mechanical interference produced with the functions by its bulk, did not incommode him.

It was in this condition that he came to me in January, 1894. I found him a well-developed, well-nourished man of medium size, in perfect physical condition except for the enlargement of the tongue; this was so bulky that it was with difficulty that he could protrude it beyond the teeth, and, in fact, it was possible for him to do so only by opening his mouth so widely as to produce a bilateral dislocation

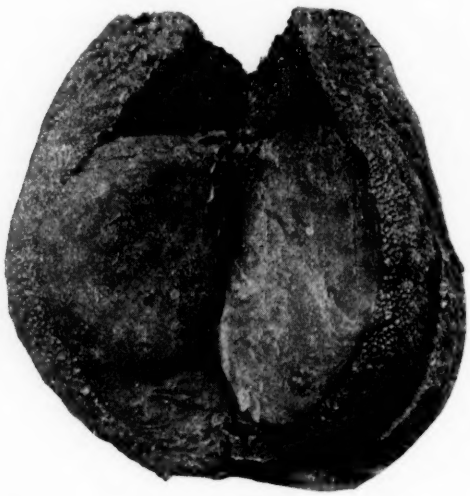
of the lower jaw, which reduced itself, when he closed it, with a snap that was loudly audible twenty feet away. This dislocation, he said, had occurred only during the previous five or six weeks. The entire anterior three-fifths of the tongue was nearly symmetrically enlarged, and was occupied by a smooth, firm, elastic mass of tissue, which was evidently a solid new growth. The mucous membrane was nowhere eroded or ulcerated, and presented its normal appearance except for a soundly-healed cicatrix on the under surface of the right anterior part of the tongue,—the site of the old operation. The growth was wholly within the tongue, which was freely movable in the mouth, with no adhesions or fixation to the surrounding structures. No enlarged glands could be detected in the mouth, below the jaw, in the neck, or about the face. His speech was thick and indistinct, and he could with difficulty make himself understood in speaking to a stranger. Mastication of solid food was not easy, and he lived mostly on semisolids and liquids. Deglutition was also difficult; but what caused him most apprehension was a sense of impending suffocation when lying on his back, which was so distressing that he feared to go to sleep lest he might roll on his back and choke.

The long duration of the disease, with the absence of any enlargement of the adjoining lymphatic glands or involvement of the enveloping mucous membrane and contiguous tissues, made me hopeful that the neoplasm was fibrous and non-malignant, though the suddenly-increased rapidity of growth, after so long a period of quiescence, was very suspicious. I advised amputation of the tongue at a point well behind the limits of the growth. After a few days of preparation of the mouth, including extraction of carious teeth, etc., to insure as nearly as possible an aseptic condition for the operation, on January 13, 1894, I removed through the mouth, by Whitehead's method, the anterior three-fourths of the tongue, making the section about three-quarters of an inch behind the posterior margin of the tumor.

The operation was an easy one; all vessels were clamped as they were divided, and tied after the removal was completed; very little blood was lost, and no shock followed. The stump was simply dusted with iodoform without other dressing, and the mouth kept frequently rinsed with an antiseptic solution. All nourishment for the first three days was given by the rectum. On January 16 he began taking liquid food by the mouth, and on the 22d was eating soft solids. He was sitting up in a chair in two days, and walking about in four. He

was allowed to talk on the third day. For the first four days the axillary temperature was 100° F., and after that 98° F.; the pulse remained normal. He made an uneventful recovery, with the wound aseptic throughout, and returned to his work on February 9, being then able to speak intelligibly, eat everything without difficulty, and sleep in any position without interference with respiration.

The portion of the tongue removed was about three inches long, two inches broad, and two inches thick, that part occupied by the tumor being irregularly ovoid in shape. A vertical median section showed that the muscular tissue of the tongue had been almost



Sarcoma of the tongue. Dorsal view through a median vertical incision. From a photograph the exact size of the specimen after preservation in 50 per cent. alcohol.

entirely replaced by the tumor, which extended to the mucous membrane on all sides except posteriorly. The tumor itself was of dense, firm structure, grayish-white in color, and appeared much like a small uterine fibromyoma. It was incompletely separable into three lobes, somewhat closely held together by tissue of a looser texture. Of these the central portion was much the largest; this is shown in the figure divided by the long median incision into two unequal segments. The second in size was located beneath and to the left side of the anterior part of the largest one; it is not shown in the figure, but its position is indicated by the short incision on the left side of

the tongue. The third, and smallest, apparently had occupied a corresponding position in the right side of the tongue, but had mostly been removed at the first operation; its site is shown in the figure by the triangular space in front of the right half of the largest lobe. The darker part of the figure behind the segments of the largest lobe represents the muscular structure of the tongue in apparently normal condition. On the under surface there was no extension of the tumor tissue, so far as could be seen and felt, into the frænum and genio-hyoglossus muscles.

The report of the histological examination by Dr. Joseph McFarland, demonstrator of pathology at the University of Pennsylvania, is as follows:

"The tumor is malignant, though, as it has shown itself to be, a slowly malignant one, *fibro-sarcoma*. It consists principally of small round cells, among which are a large number of isolated connective-tissue fibres."

The progress of the case for the first year and a half after the operation was all that could be desired. I had no opportunity of examining the condition, for the patient had returned to his home in a neighboring State. In answer to a letter of inquiry, which I sent him, he wrote me under date of May 5, 1895, that the wound remained soundly healed and looked very nicely; that there was nothing so far as he could see growing in the scar, stump of the tongue, or tissues of the mouth; that he was able to dislocate the lower jaw only by forcing open his mouth very widely, and not by projecting forward the stump of the tongue. He says, "The result is a great deal better than expected; I can talk better than before the operation, and, indeed, it is a surprise to me that I can speak and eat as well as I do. The operation has proved a great thing for me so far, and it looks at present as if the tumor would not develop any more."

On September 23, 1895, the patient presented himself at my office, the first time I had seen him since his recovery from the operation twenty months before. He stated that a few weeks previous he had first noticed a slight thickening and hardening in the tissues of the floor of the mouth in front of the stump of the tongue, which had increased rather rapidly, and had induced him to seek my advice. I found present a small mass of dense, firm tissue in the floor of the mouth, extending from the mucous membrane behind the incisor teeth to the stump of the tongue, but free at its lateral margins.

There was no ulceration, and it was covered with normal mucous membrane and smooth, cicatrical tissue. There was also in both right and left submaxillary regions a slightly enlarged lymphatic gland of about the size of a large pea; these were quite hard, and slightly tender to pressure.

He suffered no pain or inconvenience whatever, and when told that there was a recurrence of the growth in the mouth, with extension to the glands of the neck on both sides, and that an extensive operation would be required to attempt to extirpate it, he declined further interference and decided to await the result. Since that time I have not seen him, or heard from him, and cannot give the subsequent history of the advance of the disease, though I have no doubt that it has been similar to the usual progress of malignant disease in that region, and will ultimately prove fatal.

The result of this case bears a striking similarity to that of the one described by Mr. Targett, quoted from Senn on the first page of this article.

Aside from the exceeding rarity of the disease, the case presents points of interest in the histogenesis of sarcoma. I believe there can be no reasonable doubt that the tumor was primarily benign, and probably fibroid in structure. The long period of its existence, covering twenty-two years, the interval of quiescence in its growth extending over twelve or thirteen years, with the sudden and rapid increase in growth, are strong evidences to favor this view; and its location in the tongue, an organ exposed to frequent mechanical irritations from slight traumatisms in the processes of mastication and swallowing, may be regarded as a causative factor in the transition from a benign to a malignant neoplasm.

A BULLET-PROBE AND BULLET-FORCEPS NEW IN PRINCIPLE.[1]

By HOWARD LILIENTHAL, M.D.,

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ASSISTANT SURGEON TO MT. SINAI HOSPITAL.

VARIOUS instruments have been devised for the purpose of ascertaining the exact location in the living organism of metallic foreign bodies. By far the most important class of such masses of metal is that comprising projectiles which receive their impetus from engines utilizing the suddenly-applied expanding power of gaseous matter. When the projectile strikes the living body it may cause, according to the force and quality of its impact, a contusion, an abrasion, or a penetrating wound more or less deep and complicated, even to a complete perforation of the body with emergence of the projectile.

For the purposes of this paper we have to deal only with the class of cases where the whole or a part of the projectile remains embedded in the tissues.

In few words I shall mention the most available devices heretofore known for localizing the embedded projectile, and I shall then describe and present my own contribution to this branch of the surgical armament. The Nélaton probe with its porcelain button, upon which soft metal may be made to leave a visible mark, is of use only where a lead or other soft projectile is encountered. In the presence of copper, bronze, nickel-steel, or iron it is not accurate.

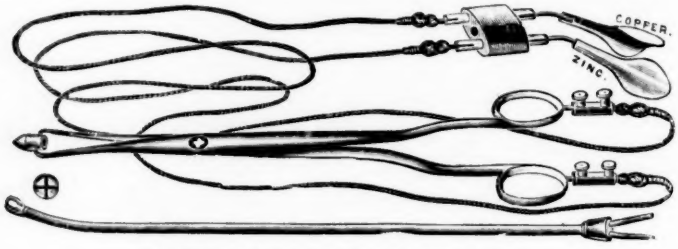
The Liebreich and the Longmore probes consist of two insulated wires running side by side and comprised in a single probe. The distal wire-ends are uncovered, but are not in con-

[1] Demonstrated at the New York Surgical Society, February 12, 1896.

tact. The wires form a part of an electrical circuit operated through a galvanometer by a small battery. The deflection of the galvanometer needle indicates when the metallic circuit is completed by the ends of the probe coming simultaneously in contact with the embedded metallic mass.

The Girdner telephonic probe is an ingenious application of the telephone-receiver, by which the patient's body becomes the operating battery, whose internal electrical resistance is varied by the contact of the probe with the embedded piece of metal. This varying resistance causes a distinct scratching sound which is heard in the receiver held to the ear.

The instrument which I have devised is founded upon the familiar fact that when two dissimilar metals, as, for example, a silver and a copper coin, are held simultaneously in the mouth,



Lilienthal's bullet-probe and bullet-forceps.

the one upon the tongue and the other beneath it, a distinct and unmistakable electrical sensation, together with a strong metallic taste, is perceived as soon as the metals are brought in contact, but not before. The sensation is a continuous one as long as the metals touch each other. Sensitive individuals may even see a slight flash of light.

My apparatus consists of a mouth-piece made of two metal plates which fit *at the sides* of the tongue, one of copper, the other of zinc, stiffly and completely isolated from each other by being set in a hard rubber frame. Two insulated wires are connected, one with the zinc plate, the other with the copper. The probe itself is a metal tube containing the continuations of the wires just mentioned. The tip of the probe is isolated from the shank by a hard rubber washer. The tip consists of two or four

(or other even number) bright metallic pieces separated from each other by thin hard rubber or similar material, and connected with the insulated wires in the probe. These hidden wires lie loosely in the probe shank so that it may be bent in any way without putting them on the stretch. They are firmly fixed to a plug in the near end of the shank so that they cannot be drawn tight. From this plug emerge two connecting pins to which the wires from the mouth-piece are to be attached.

When the operator holds the mouth-piece in position, by closing the teeth upon it, nothing is perceived until the electrodes in the probe end touch metal, when an immediate, *continuous*, and unmistakable sensation, together with metallic taste, is experienced. No contact except a metallic one will produce this phenomenon, the current engendered by the mouth-battery being too weak to be appreciated until this battery is short circuited.

The probe end may be made of various shapes, giving more or less opportunity for double contact. It is found, however, that for a small button two electrodes are sufficient, while for a larger button four or more may be of advantage. A slight rotation of the shank, whether it be straight or curved, will usually suffice to establish double contact. The shank is made of thick-walled, flexible-metal tubing, but it should not be bent too near the end for fear of breaking the button. The probe shank may also be made wholly or in part of flexible material, for example, jointed metal or, still better, woven catheter material (silk or linen).

The probe may be improvised as follows: Cut both ends off a soft catheter. Take two pieces of wire and insulate them to within an inch of their ends by wrapping round each wire a layer of gutta-percha tissue and then warming, or even by winding the wire with adhesive plaster. Run the wires through the catheter, allowing two long ends to project at the proximal end. Two short ones each bent on itself so that a smooth loop of wire may present, instead of a rough cut end, should project at the distal end. A drop of hot sealing-wax at each end fixes the wires to the catheter and isolates them firmly from each other. The long

ends of the wire are now to be wound tightly around two coins, the one around a copper, the other around a silver piece, previously, of course, removing as much as necessary of the gutta-percha insulation. Entirely cover these connections with sealing wax. This probe will now work well enough for an emergency, but the danger of short circuiting in an improvised probe must be borne in mind. Short circuiting in the probe made by the instrument-maker is hardly a possibility.

With this instrument I performed the following experiment: Five shots were fired into a piece of raw beef, the bullets passing through a tough fascia, through two layers of muscle, and to or into bone beyond. Four of the bullets (twenty-two calibre) were easily found. The fifth eluded my search, but section showed that the ball had bounded back from the bone, making a channel almost parallel with the one of entrance. The probe, therefore, never came in contact with the projectile.

The advantages of my instrument are its simplicity and accuracy. No complicated mechanism, and neither battery nor galvanometer are needed. It will probably be less than one-fourth as expensive as the telephone-probe. When in a very noisy place its working by the sense of taste instead of hearing will, perhaps, give it an advantage over the telephonic instrument, and if the operator happen to be at all deaf or troubled with tinnitus, his observations by taste will be more reliable than those by hearing.

In operating the telephone-probe all connections must be absolutely tight or an erroneous impression may be conveyed. As soon as the probe is in the tissues, the loose connection will be heard to give out the grating sound as if the bullet had been found. To be sure, this loose connection should not exist, but if by chance the connections in my instrument are not perfect we may fail to make an observation, but we cannot make a false one. The metal mouth-piece of the telephone-probe may cause a false observation by contact with a metal dental filling.

A bullet-extracting forceps is also herewith presented. One blade of an "American" bullet-extractor is insulated by hard rubber and Japanning to within about a tenth of an inch of its

tip. An ivory or other non-conducting peg is used instead of the usual steel lock-screw or lock-peg. A connecting pin is soldered to each handle for connection with the conducting wires which go to the mouth-piece.

When the forceps (really but a modification of Liebreich's) holds the bullet, the operator instantly and constantly perceives the mouth phenomenon. The taste and sensation cease at once if one or both blades lose their hold on the bullet.

The telephone, obviously, cannot be used to make a bullet-forceps, for the sound will be heard whether one or both blades touch the projectile. These instruments are made by Reynders.

LAPAROTOMY FOR PERFORATING TYPHOID ULCER OF THE ILEUM: DEATH ON THE FOURTH DAY FROM OBSTRUCTION OF THE HEPATIC FLEXURE OF THE COLON BY AN OLD ADHESION BAND.[1]

By J. BION BOGART, M.D.,

OF BROOKLYN,

SURGEON TO THE METHODIST EPISCOPAL HOSPITAL.

NOTWITHSTANDING the fatal result, the writer feels it to be his duty to place the details of this case on record, especially as he finds more in it to encourage than to discourage surgical intervention in this class of cases. The findings of the autopsy, taken in connection with the history of the case after operation, make the recovery of this patient, in the absence of old adhesion bands, almost certain. That fact ought, therefore, to be considered in assigning it to its proper place in the statistics of the results of operations for the relief of this emergency.

While doubtless the number of typhoid intestinal perforations must be considerable, the total number of recorded cases submitted to operation is still quite small, almost too small, I think, to be of statistical value. Appended to an account of a successful operation upon a very desperate case,[2] Dr. Abbe briefly reviews the reported cases up to that time, and finds a total of twenty-four cases with six recoveries, from which, deducting doubtful cases, seventeen with three recoveries remain.

[1] Case related and specimen presented at a meeting of the Brooklyn Surgical Society.

[2] Medical Record, January 5, 1895.

Despite this rather poor showing, one cannot read the reports of the recorded cases without realizing that, as in acute perforative appendicitis without limiting adhesions, while most of these cases will necessarily prove fatal, there is much to be hoped for from prompt and skilful surgical interference.

C. S., a man, thirty years of age, was first seen by me in consultation with Dr. Charles M. Bellows, at midnight, November 11, 1895.

Five years before he had been suddenly seized with sharp pain in the right side of the abdomen. The pain continued for three days, and was followed, one year later, by a similar attack. He had frequently since had pain in this region lasting but a few hours.

Four months before he had developed typhoid fever. The fever pursued the usual course, disappearing during the fourth week. Three weeks later he had a second attack of fever lasting about three weeks, and about ten days before I saw him, the fever again reappeared. The temperature had only been normal again for a day or two when, about five in the afternoon, he was suddenly seized with severe pain in the lower portion of the abdomen, accompanied by nausea and vomiting and a chill, followed by a temperature of 104° F., and later by several copious loose stools. The pain was of a paroxysmal character and was attended by considerable rigidity of the abdominal muscles, especially of the lower half of the recti. Tenderness was most marked in the hypogastric region, and was possibly greater to the right than to the left of the median line. Abdomen only slightly distended. Pulse rapid and weak. By midnight his temperature had fallen to 99° F., with a pulse of 120. Countenance pallid and anxious. Hot turpentine stupes were ordered and the patient seen again at 7 A.M. He had passed a restless and painful night, and his condition remained practically unchanged. He was removed to the Methodist Hospital, where, at 10 A.M., his temperature was 101° F., pulse 108, and respiration 36.

Operation, under ether anæsthesia, at 1 P.M., November 12, 1895: Oblique incision in the right inguinal region. As the peritoneal cavity was opened a small quantity of sero-pus escaped. Search for the appendix revealed that organ lying just to the right of the brim of the true pelvis, with its distal extremity pointing downward and inward and adherent by its side to a coil of ileum at a point about four inches from the ileo-cæcal valve. On separating the appendix from its

attachment to the ileum a minute perforation of the bowel was exposed. The perforation was thoroughly concealed and apparently completely closed by the adhesion of the appendix to the gut and the surrounding inflammatory exudation. Attention was directed to the perforation, which seemed at first to be no larger than a pin-point, by the escape of gas which bubbled out and was followed by a trifling amount of mucus. The intestine was at once seized on each side of the perforation and drawn out of the wound, where, after thorough cleansing, the perforation was rapidly closed by a running Lembert suture of fine silk. The intestine was then replaced and the appendix with its mesentery ligated at its base and excised. After packing the suppurating area with alternate folds of iodoform and sterilized gauze, the upper portion of the wound was sutured with silkworm gut and an absorbent dressing applied.

The patient bore the operation well, and, at 4 P.M., his pulse was 126, temperature 98.8° F., respirations 36. By midnight his pulse had fallen to 108, the same as before operation, temperature 99.8° F., respirations 32. During the succeeding forty-eight hours he was quite comfortable, his temperature never exceeding 100° F.

On the morning of the second day, about forty-four hours after operation, the external compresses were changed. There had been considerable sero-sanguinolent discharge, but the appearance of the wound was excellent, the bowels were only moderately distended, and the patient had suffered comparatively little pain. Small doses of hot milk had been begun twenty-four hours after operation and had been gradually increased, so that at this time he was taking two ounces every hour. Four-ounce doses of the solution of the citrate of magnesia were now ordered every two hours for four doses, to be followed, if necessary, by a simple enema. The first dose of magnesia was given at 1.30, the last at 7.30, and the enema at 10 P.M. The enema was effectual, but at 12.30 A.M. the patient complained of severe abdominal pain, and was restless and nervous. At 2.15 he vomited milk immediately after taking it, and at the same time his abdomen was observed to be very much distended. Milk was discontinued and a rectal tube passed bringing away a small amount of gas. Four hours later he again vomited a small amount of coagulated milk. When seen by myself, at 9.30 A.M., for the first time since the preceding morning, the change in the patient's appearance was very marked. His countenance bore an anxious expression, he was nervous and restless, and complained of the distress of the abdominal distention.

His pulse had increased in frequency and had failed in character. On reintroducing the rectal tube his bowels moved slightly and a small amount of gas was expelled. At noon he vomited again, and at 2 P.M. began vomiting a dark offensive fluid with accompanying hiccough. At four his temperature was 98.6° F., pulse 116, respiration 30. The abdominal distention had apparently not increased. At five, he was etherized and the abdominal wound reopened. Pus was found between the muscular layers of the sutured portion of the wound, but the intra-abdominal packing was clean. At this point the desperate condition of the patient forbade further interference. He was therefore put to bed, and under vigorous stimulation regained consciousness, but died suddenly at 12.30 A.M., four days seven and a half hours after the perforation, and three days eleven and a half hours after operation.

At the autopsy, the sutured intestine was found sound, the site of perforation being the centre of an ulcer about three-eighths by one-half inch in diameter. The adjacent ileum was considerably congested and the entire small intestine, the cæcum and ascending colon distended, the remainder of the large intestine collapsed. Attention was thus directed to a stricture at the hepatic flexure of the colon, caused by old adhesion bands, reaching down from the gall-bladder. Under ordinary conditions of normal distention, the lumen of the bowel would be only partly occluded by these bands, complete obstruction having been determined by increased angulation resulting from hyperdistention of the ascending colon.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, February 12, 1896.

The President, FRANK HARTLEY, M.D., in the Chair.

DOUBLE DISLOCATION OF THE STERNAL END OF THE CLAVICLE.

DR. L. W. HOTCHKISS presented a man, about twenty-eight years of age, who, on January 28 last, had sustained injuries by the wheels of a heavy truck passing over him. There was a wound of the forehead, a transverse fracture of the right humerus in its middle, a complete forward (presternal) dislocation of the left clavicle on the sternum, and a partial dislocation of the right clavicle upward and backward. The right dislocation had reduced itself, but that on the left side was not reducible by ordinary means, the fracture of the humerus interfering to a considerable degree with manipulation, and it still persisted. It did not particularly impair the functions of the arm, though the deformity was considerable. The case was presented to illustrate a rare dislocation and to show how little impairment of function had resulted.

DR. B. F. CURTIS said he had never seen a double traumatic dislocation of the clavicle, but he had photographs of a case of double dislocation, apparently of congenital origin, in a girl of thirteen years. There was also some lateral curvature of the spine, and it was for that that she came under his care. The clavicles were not absolutely dislocated, but in certain positions of the arm the sternal end of each of them would slip out almost entirely on the anterior surface of the sternum. There was no pain, apparently no weakness, and the functional disturbance was so slight that nothing was done for the condition.

RESECTION OF COLON FOR CARCINOMA WITHOUT RECURRENCE.

DR. HOWARD LILIENTHAL showed a man on whom he had operated the 18th of June, 1894, resecting six inches of the transverse colon which was the seat of stenosing adeno-carcinoma, which had been present for at least a year. The stenosis had become so great that only a small-sized lead-pencil could be passed through the stricture at the time the specimen was removed. There was great emaciation and pain. Anastomosis was made with a Murphy button of enormous size, which was passed on the eighteenth day. The man gained thirty pounds in weight in a short time, and had remained in perfect health since. There were no signs of recurrence. A number of nodules in the mesentery had been removed, but there were innumerable small ones which had to be left.

The button, which was an inch and three-quarters in diameter, and another about an inch and one-quarter in diameter, were shown. In another case he would use the smaller one of the two, but a larger button was required in the portion of intestine which contained solid fæces than in the higher portion in which the contents were always fluid.

DR. BRIDDON referred to a case that had occurred to him a few hours before the meeting of the Society. A male patient, thirty-eight years of age, was sent into the Presbyterian Hospital for the surgical treatment of what was supposed to be a case of appendicitis; when under ether an exceedingly hard tumor was found, immovably fixed in the region of the right kidney, and it would have been taken for that organ had it not been for its very pronounced induration; it reached from the border of the ribs to below the level of the umbilicus, and as far to the left as the median line.

An incision of about five inches was made along the outer border of the right rectus, when the abdominal cavity was opened, the omentum was found intimately adherent to the anterior and inferior surfaces of the border of the right lobe of the liver, to the upper portion of the ascending and the right half of the transverse colon, to the duodenum, and immediately adjacent small intestine; in the centre of this adherent mass was a hard, nodular growth about two inches in diameter, and about one inch in thickness; it was exceedingly difficult, and took a long time, to separate these adhesions which were of the most intimate character; it was at first thought that they

enclosed the gall-bladder, but when the area of that viscus was disclosed, it was found free. The centre of the mass was bedded into an excavation formed for it, immediately in front of the hepatic flexure, and it was found extremely difficult to enucleate it from its position; after ligaturing the surrounding healthy omentum in sections this was accomplished, and a section of the mass revealed its malignant character; it was apparent that this was a secondary growth, and that in the flexure of the gut itself was a mass about three inches in diameter, fixed almost immovably to the abdominal wall; the posterior wall of the duodenum was exposed, the transverse and ascending colon could be traced into the mass, and a coil of small intestine in the immediate vicinity was adherent to the tumor.

At this stage of the operation, two hours had been occupied in bringing order out of the intricate involvement of the parts; it was extremely doubtful if colectomy could have been successfully accomplished, so it was thought best to make a lateral anastomosis between the bowels on either side of the tumor, which was easily accomplished through the medium of a Murphy button.

Dr. Syms said he had assisted Dr. Outerbridge in resecting about three inches of the transverse colon for carcinoma, making anastomosis with a large-sized Murphy button. The tumor reached beyond the intestine, but there were no disseminated nodules like in Dr. Lilienthal's case. There had been no recurrence during a little over a year. He would be afraid to use a button as large as the one shown by Dr. Lilienthal, lest it should not pass.

EXTENSIVE RESECTION OF RIBS FOR EMPYEMA.

Dr. Francis W. Murray presented a man, thirty-eight years of age, on whom he had performed thoracoplasty for old empyema. His illness had begun in May with an attack of acute pneumonia on the right side. This subsided at the end of ten days, but a few days later he was taken with dyspnœa, which steadily increased, and on the 7th of June he was admitted to the New York Hospital under the care of Dr. Bull. The right chest was then full of pus. Dr. Bull made an incision about the seventh intercostal space. Inserted a trocar and canula, and drained the chest. Because of the man's very low condition, no rib was resected. The relief was temporary, and a few days later the incision was enlarged, and an inch and a half of a rib was removed behind. Two drainage-tubes were inserted. The patient was able to be out of bed after a few days. When Dr.

Murray went on duty there was still considerable discharge, the man's general condition was bad, no appetite, temperature at night. He advised resection of ribs, but it was refused. The man went out, but returned again, and in July the ribs were resected, extending from the third to the tenth inclusive, two inches and a half to three inches of each rib being removed. The pleural wall was cut away, the lung was found to be bound to the spinal column and under the clavicle, permitting very little expansion. There was a very thick pyogenic membrane on the pleura. It was removed with a sharp spoon, the cavity was washed out with sterilized salt solution, and packed with gauze. Anæsthesia was begun with chloroform, was continued with ether, but on account of the bronchorrhœa it was necessary to return to the chloroform. The fourth day after operation there developed œdema of the left lung, which yielded after six hours' constant treatment with cupping, digitalis hypodermically, carbonate of ammonia, etc. The man then went on to improve gradually, the chest was washed out every two or three days and repacked with gauze. The wound steadily healed, and the man left the hospital in September, and was referred to the out-door department. He has gained thirty-eight pounds in weight, and has returned to work. There is still some discharge through a wound larger than a half-dollar. The spine is straight, the chest, of course, has sunken on the right side, but there is good respiratory murmur over the upper half of the chest, showing that the lung has expanded. Later on, when the discharge had ceased, the opening in the chest will be closed by a plastic operation.

Dr. Murray had done the same operation in another case of empyema in which there had before been spontaneous perforation. The man did well for ten days after the resection, but then suddenly developed œdema of the lung, and died in spite of energetic treatment. It would seem to be well, therefore, to be ready to treat pulmonary œdema at any time within a few days after operation.

THE RELATION OF THE WEATHER TO FATALITY FOLLOWING SURGICAL OPERATIONS.

Dr. F. W. Gwyer read a paper on this subject. (See page 369.)

Dr. Arpad G. Gerster said this subject had received a good deal of attention in the past, having served as a welcome theme for learned disquisitions upon the question of mortality following surgical operations. Ashhurst had reviewed the literature on the subject

in his "System of Surgery." The cause of death in those days might seem clear to us now, but to the surgeons at that time it was mysterious, and they welcomed every suggestion which would throw some light upon the curious and rather capricious variations in the results of their work. Even at that time it was thought that operations ought to do better when undertaken during weather which was dry and clear, yet it was observed that the results were about the same as during weather of the opposite character. To-day we know somewhat more of the real causes of ill success in surgery, and he thought we need not enter into remote explanations when the chief ones were near at hand. For instance, in one of the cases quoted by the author the man had in his belly three Murphy buttons. It was probable the conditions which necessitated putting in those three buttons were sufficient to kill anybody in any kind of weather, and it was a question whether a little more or a little less of atmospheric pressure or moisture would have anything to do with it. The same remark probably was applicable in the case of rupture of the bladder. To make such inquiry of value he thought it would be necessary to eliminate cases in which the condition of the patient was quite sufficient to cause death independent of the weather. If one eliminated cases of secondary hæmorrhage, of great injury, of sepsis, etc., and retained only those in which there was no evident cause of death, there would be comparatively few left. Therefore, while he thought the subject was of academic interest, he did not think it of much importance what was the weather when an operation was to be undertaken.

Dr. Gerster said he had occupied himself with the question under discussion not a little, especially in former years, for surgeons knew what disagreeable weather meant,—discomfort in going out, a dark operating-room, etc.,—yet he must admit, after a glance over twenty-four years of surgical work, that nearly always where death had occurred there was an adequate cause to be found quite independent of the weather.

PIN IN THE APPENDIX CAUSING CHRONIC APPENDICITIS.

Dr. Parker Syms presented a foreign body, consisting of a toilet pin in the midst of a fæcal concretion, and gave the following history connected with it: A young woman, twenty-one years of age, had enjoyed good health till 1889, when she had the first symptoms

of appendicitis. There suddenly formed an acute abscess of large size. It was not treated surgically, but opened spontaneously. After discharging freely for a short time it became apparently healed. Three months later she had a similar attack. After this she had an abscess form every few months till 1893. She had no attack from 1893 till May, 1895, when she first came under Dr. Syms's care with a large abscess pointing in the groin. It was evacuated by simple incision. No attempt was made to remove the appendix. The abscess was drained by a tube. It soon was reduced to a sinus, which continued patent.

In December, 1895, he operated on her for removal of the appendix. He found the tip of the appendix attached to the iliac fascia, under which there was a cavity. The sinus led to this cavity, not to the appendix direct. In the appendix was found a toilet-pin, the head of which was covered by a firm fæcal concretion. Patient made an uneventful recovery after the removal of the appendix with its contents.

CHYLOUS CYST OF THE MESENTERY.

Dr. Syms presented a mesenteric cyst with the following history: A young man, nineteen years of age, had suffered from pain in abdomen for about two years, when in 1895 a tumor was discovered in his abdomen. He was first seen by Dr. Syms in the latter part of July, 1895.

There was found a well-defined, very freely movable, elastic tumor, which seemed to be cystic, situated in the median line of the abdominal cavity. It extended a little above the umbilicus.

August 2, 1895, median laparotomy was performed. The tumor was found to be a cyst situated in the mesentery of the ileum. It was about four inches in diameter. By cutting through one layer of the peritoneal covering the sac was removed entire. The wound in the mesentery was sutured with catgut. The patient made an uneventful recovery.

The cyst contained fourteen ounces of pure chyle.

CANCER OF THE BLADDER.

Dr. Robert Abbe presented a specimen of cancer of the bladder removed that afternoon from a man aged fifty-five years. The tumor, which was in the right anterior half of the bladder, crossing a little over the median line, was resected, and the bladder was sutured. An

opening was left sufficient for suprapubic drainage. The patient had suffered very little pain, and except for frequent micturition had had very little trouble from the disease of the bladder. The first hæmorrhage occurred five weeks ago, and for a few days before the operation the urine was foul. In order to resect in healthy tissue it was necessary to remove about one-third of the bladder.

(*Later Note.*—Two weeks later the patient was making an excellent recovery.)

Stated Meeting, February 26, 1896.

The President, FRANK HARTLEY, M.D., in the Chair.

TRAUMATIC SEPARATION OF THE EPIPHYSIS OF THE LOWER END OF THE FEMUR.

DR. CHARLES MCBURNEY presented one of the two patients whose cases he had recited in the paper read by him before the society, January 22 previous (see page 501), illustrating operation for separation of the epiphysis of the lower end of the femur of traumatic origin. No deformity had been left, and there was no evidence of injury excepting the longitudinal scar, about three inches long, on the outer side of the thigh, extending to the knee. There was very slight limitation to extreme flexion only, which, no doubt, would soon disappear. Dr. McBurney described the various movements practised upon the limb in attempting to make reduction, and as all failed he finally resorted to operation. He considered the injury a rare one. He had seen only these two cases, and they had come under his care within a few weeks of each other.

INTRACRANIAL IMPLANTATION DERMOID TUMOR.

DR. FRANK HARTLEY read a paper on the above subject. (See page 573.)

DR. F. TILDEN BROWN said he had seen Dr. Hartley operate on this very interesting case, and had secured some of the contents of the cyst, which he examined with considerable care. At first he thought it was a dermoid, although its situation was exceptional and

it lacked some of the contents usually seen in dermoids, but on looking up the subject he had come to view the case as undoubtedly an example of dermal implantation cyst as described by the reader. He had found only one somewhat similar case in the English language, reported by Treves. It involved the occipital region in a woman, and followed an injury. The aperture in the frontal bone in Dr. Hartley's case was of considerable size, much larger, he supposed, than at the time of the injury, and was caused apparently by pressure of the tumor producing atrophy.

DR. HOWARD LILIENTHAL mentioned the fact that about a year and a half ago a German author, whose name he could not recall, reported two cases of this kind and referred to the literature. One of the cases was in the finger of a sewing-woman, the other in the finger of a soldier, and both patients, if he recollected correctly, came for operation two or three years after the original injury. The tumors had attained about the size of a pea, which, for their duration, corresponded with that of the tumor in Dr. Hartley's case. He did not doubt the correctness of the diagnosis in the case just reported.

OPERATIVE TREATMENT OF CARCINOMA OF THE BREAST.

DR. MCBURNEY presented a female breast removed a few days previous for characteristic small fibrous carcinoma. The operation was an extensive one, such as he now always performed for this condition, removing with the tumor the pectoralis major and minor, and carefully removing all the contents of the axilla as far as the clavicle after free dissection. He presented the specimen because it showed very clearly by gross appearances how deeply a small carcinomatous tumor of the breast could involve the muscular fibre beneath. Strands of carcinomatous tissue could be seen running directly down into the muscular fibre and could be felt there. The specimen recalled the discussion on the propriety of extensive removal of muscle in cases of carcinomatous disease of the breast. Dr. McBurney was very strongly in favor of it. In the present case, he did not think any one who believed in a less radical operation than removal of all the muscle would have known what part to remove and what to leave. When the patient's arm was drawn backward and upward, with the pectoral muscles on the stretch, the tumor became so immovable that it seemed

to be attached to the thoracic wall, yet the *under* surface of the pectoral muscle was entirely free from disease.

Dr. McBurney had been very much pleased with the operation recommended by Halsted, of Baltimore, and Willy Meyer, of New York, whereby the muscle was removed very completely. The specimen shown illustrated one good reason for complete removal of the muscle, and another practical one was the facility which the method afforded for very complete dissection of the contents of the axilla. In fact, he had learned that it was quite impossible to clear away the contents of the axilla without at least dividing the muscles. A week or two ago a patient had been brought him whose breast, it was stated, had been removed four months previously for cancer, and the axillary space cleared away quite to the satisfaction of the surgeon, who felt that all the disease had been removed. Yet the only evidence of an operation was the cicatrix of an incision which included apparently an oval extending a little outside of the nipple. The mass of tissue about the neighborhood of the incision was half as large as the other breast, which was well developed. Enlarged glands could be felt readily beneath the pectoralis major high up and at the root of the neck. As already stated it was claimed that the axilla had been cleared, yet when Dr. McBurney came to do the secondary operation, removing both pectoral muscles and the glands at the root of the neck and in the axilla, he could find no cicatricial tissue whatever in the axilla, and he came to the conclusion that the operator had at the most attacked the axilla only in its very lowest part. He felt that every member of this Society must have seen enough of unsatisfactory results from imperfect operations on the breast to now place themselves on record as to what they proposed to do in disease of this region; whether they were to stand as endorsing limited operations, the extent of which was to be practically decided by the gross appearances, or only the more radical operation. The former method would seem to be, in the light of experience, totally unscientific and unsupported by results.

APPENDICITIS OBLITERANS.

Dr. McBurney said, in presenting a specimen of appendicitis obliterans, that the lesion was not very rare. Although he had seen several cases, he was not able by the clinical history and physical signs to distinguish a case of obliterans from some other forms of chronic appendicitis. In this case, however, the patient gave a his-

tory somewhat suggestive of obliterating appendicitis. He was thirty years of age, in good general health, but had been annoyed for about three years with very frequent, almost continuous, unpleasant sensations of burning and pain in the region of the appendix. But he had never had an acute attack, and had never spent a day in bed from an attack of appendicitis. During the whole of this time, two or three years, he had been quite demoralized from dread of what might happen to him, and for that reason he wished an operation performed. Dr. McBurney had seen him a number of times, had not urged an operation, but, seeing that the matter was greatly disturbing the patient's peace of mind, he felt that he was justified in consenting to do it. As soon as the appendix was reached it was recognized as a case of appendicitis obliterans. The organ consisted of a small cord coiled upon itself, attached to the colon, and without a canal. The mesentery was very fat.

Other cases which Dr. McBurney had seen, giving a similar recent history, had begun with attacks of acute appendicitis, so that one might suppose that each attack of inflammation had accomplished a certain amount of obliteration, and this form of reparative process had gone on month after month. In such a case one could understand why the patient should have such disturbing sensations, and he had known some to suffer seriously by loss of flesh and general health, which were restored after operation. In the present case it was difficult to account for the severity of the symptoms by the lesions present. The only theory which he could offer was that the nerve filaments became compressed by the connective tissue infiltration, and gave rise to the sensations complained of.

SARCOMA OF THE STOMACH.

DR. HARTLEY presented an oval sarcomatous tumor removed from the posterior wall of the stomach. The woman was fifty-four years of age, was admitted to hospital April 23, 1895. Except for long-standing dyspepsia, she had been in perfect health until five years before. At that time, without any evident exacerbation of gastric trouble or other cause, she vomited a large amount of coffee-grounds material. The vomiting did not recur, and she went on for four years in good health, except for symptoms of indigestion, which were never sufficiently severe to interfere with her work. A year ago she vomited blood, coffee-grounds and clotted in character, for five successive mornings. Pain in the back, previously slight, now be-

came worse, and she noticed a considerable swelling in the epigastrium. Two weeks ago she had another spell of vomiting, bright red and clotted blood. The past ten years she had had occasional attacks of jaundice.

On physical examination there was felt in the left lumbar and left umbilical region a rounded tumor, hard, elastic, freely movable, and readily displaced into the left hypochondriac region. Dr. Hartley was disposed to regard it as a floating kidney. After careful examination under ether this diagnosis was considered doubtful. An incision was made just to the left of the left rectus, the hand was introduced, the kidney was felt *in situ*, the large intestine bulged into the wound and was normal. Behind the mesocolon and in the splenic region was the large tumor. The spleen could not be felt. The mesocolon was torn through, and the surface of the tumor in the lesser sac was disclosed. The tumor was brought through the opening in the mesocolon, when it was seen to arise from the posterior wall of the stomach by a pedicle an inch and a half in diameter. The stomach was pulled well forward, grasped below the pedicle, its wall was cut through entirely around the pedicle, removing a portion of its wall with the tumor. The opening in the stomach was then closed by mucous suture, of fine silk, continuous, interrupted layer sutures of white silk united the muscular coats, and one row of fine black silk Lembert sutures were introduced. A piece of sterilized gauze was placed over the suture line for drainage. The patient was nourished for a few days by nutritive enemata, and April 28 was given milk diet by stomach. She was discharged cured June 1.

The report of the pathologist was as follows: Pear-shaped tumor, 15 x 10 x 8 centimetres. Its surface is smooth, but nodular. It is apparently covered by peritoneum. The tumor is cystic, the cysts varying in size from one-half to four centimetres in diameter. The tumor is firm in consistency, of a pale gray color. An area of stomach wall, 5 x 4 centimetres, has been removed with the tumor. The mucosa is hyperæmic, but not ulcerated. Sections of tumor show the typical appearance of spindle-celled sarcoma. The vascular supply is abundant, and the vessels are thin-walled and large.

TRANSACTIONS OF THE SECTION ON GENERAL SURGERY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA.

Stated Meeting, January 10, 1896.

DR. OSCAR H. ALLIS, Chairman, in the Chair.

CASE OF CONGENITAL ABSENCE OF THE VERMIFORM APPENDIX AND OF INTESTINAL DIVERTICULUM.

DR. JOHN B. ROBERTS detailed the particulars of the following case:

A man, aged sixty years, was admitted to the Methodist Hospital in November, 1895, with a large strangulated scrotal hernia on the right side. He cut down upon the hernia, relieved the strangulation, and did the operation for radical cure according to the method of Bassini. The hernial sac contained only the cæcum. There was no appendix, but at one point upon the cæcum was a dimple-like depression surrounded by an elevation of the peritoneal surface. This evidently represented a defective development of the appendix.

The patient told him that about two years previously he had been operated upon for strangulated hernia by Dr. O. H. Allis, and ten or fifteen years previous to that time by Dr. W. Joseph Hearn for a similar condition. No operation had been done upon him during his boyhood or previous to that performed by Dr. Hearn. Both Drs. Hearn and Allis report that their operations did not include removal of the appendix. Neither of them seemed to have noticed any special peculiarity about the cæcum. Indeed, it is uncertain whether at that time the cæcum was the portion of intestine contained in the hernial protrusion.

Two days after the herniotomy the man developed symptoms of intestinal obstruction, and Dr. Roberts opened his abdomen in the

middle line. This disclosed the fact that a portion of the ileum close to the ileo-cæcal valve had become entangled among and was constricted by adherent coils of bowel which had lost their normal relation by reason of extensive inflammatory adhesion. These adhesions probably resulted from old inflammation due to previous attacks of peritonitis, caused most probably by the early attacks of strangulation. The colon was puckered up and twisted by firm fibrous adhesions, evidently existent for many months or years. At this second operation he was again able to notice the absence of the appendix.

Dr. Roberts also referred to the fact that Dr. John M. Swan records, in the *University Medical Magazine* for December, 1895, a case of congenital absence of the appendix observed in the dissecting-room, and mentions a similar condition as having been observed by Guitèras and Ferguson.

The deformity is probably quite unusual.

Dr. Roberts also reported an unusual congenital deformity which he had recently seen when assisting Dr. L. W. Steinbach in an abdominal operation. Projecting from the ileum a few inches above its entrance into the cæcum was a diverticulum or pouch of the intestine about one and a half inches long. It had the same gross appearances as the intestine, and was evidently a bag or pouch with similar walls communicating with the interior of the intestinal tube. It was evidently hollow ; at its base it was about a half inch wide, and it tapered to a rounded point. It was connected with the gut at its mesenteric border, and was attached to the mesentery, or developed upon or in it. It was, if he remembered correctly, only seen on one side of the mesentery, which would seem to indicate that it was adherent to it. No abnormal adhesions were noticed and it did not appear to have been attached by inflammatory action, though it is true that there were evidences of old inflammatory adhesions about the colon near the cæcum. Its point was directed upward,—that is, away from the cæcal end of the ileum. No careful examination of the relations of the structure was made.

Dr. Alfred Stengel suggested that in considering the diverticulum Dr. Roberts referred to, it would be well to take into consideration a from of diverticula developed after birth, and which corresponds more closely with the case in point than does the ordinary Meckel's diverticulum. The form to which he referred is found in all parts of the intestinal canal and usually lies adjacent to the mesen-

teric attachment. There may be but one diverticulum or there may be a number. They are supposed to be due to a weakness or diastasis of the muscle fibres of a certain locality with a consequent herniated pouch of mucous membrane very similar to the posterior diverticula of the œsophagus or pharynx due to weakness of the inferior constrictor muscle, and pressure upon the mucous membrane at the weakened spot.

It seemed probable to him that the case under discussion belonged to this category. In the autopsies he had made a number of Meckel's diverticula had occurred, but all were on the other side of the gut,— that is, opposite the mesenteric attachment. It is generally held that they are always so; although it is possible exceptions might occur.

SIMULTANEOUS OPERATIONS FOR APPENDICITIS AND MASTOIDITIS.

Dr. John B. Roberts also reported the following case: A woman was admitted on November 8 to the Methodist Hospital suffering from pain in the head and pain in the abdomen, which was sufficient to make her keep her right thigh partially flexed on the pelvis. She gave a history of having long-standing ear-disease and was quite deaf. Twelve days previously she had felt pain in the right iliac region and behind the right ear. She was very certain that the pain appeared at these two points on the same day, but said that the pain in the abdomen came a short time before that in the head.

On the following day, November 9, she said that the pain in the mastoid region was then more intense than that in the abdomen, though the pain in the abdomen had come a little while earlier than that in the mastoid region. The woman was quite deaf, but answered questions well, though she seemed a little heavy. Her temperature was over 104° F., her pulse rapid, and the pain in the head severe. There was no discharge from either ear, but both membranes were destroyed by old ear-disease. Her right thigh was somewhat flexed upon the pelvis, and a mass could be felt in the right iliac fossa. After her bowels had been opened by an enema, he made an incision to evacuate the supposed pus from the iliac region, while Dr. Randall trephined the mastoid process.

The incision was made on the lateral aspect of the abdomen so as to get behind the appendix and open the abscess cavity outside of

the peritoneal cavity. The abscess was opened with the tip of the finger burrowing downward and backward on the outer side of the colon. Meanwhile Dr. Randall was engaged in cutting into the mastoid with sharp spoons. He found no pus though the bone was eburnated. He had previously examined the eye-grounds and found no evidences of choking of the disks.

The patient's temperature promptly fell, and the next day her hearing was much improved, showing doubtless that the operation on the mastoid had relieved the congestion. Her pain in both regions was practically gone, though she occasionally had shooting pains in the right iliac fossa. The wound was left open, to facilitate drainage of the pus, except at its two extremities, where a few sutures were employed. She made an uneventful recovery, though complete union of the abdominal incision was delayed by a small sinus in the region of one of the stitches used to hold part of the wound surfaces together. Her hearing remains about as it was before operation, perhaps a little improved.

POINTS IN THE DIAGNOSIS AND PATHOLOGY OF APPENDICITIS.

Dr. D. T. Laine read a paper on the above subject in continuation of the discussion of appendicitis. After briefly referring to the anatomy of the appendix and to the pathological lesions which have been found in it, he discussed the relations of bacterial infection to the usual causes of appendicitis, arguing that other factors necessarily entered into the causation of the disease, these he enumerated as (1) deficient drainage, either from external mechanical causes or cicatricial strictures of the appendix itself; (2) obstruction or deficient blood-supply to an embryological organ of low vitality, whose lumen is the natural habitat of numerous forms of micro-organisms; (3) foreign bodies and fæcal concretions; (4) chemical poisons derived from the contents of the alimentary canal; (5) the power inherent in each individual of resisting septic absorption. He thought the most convenient classification of the disease to be into (1) acute appendicitis; (2) acute perforative appendicitis; (3) chronic and relapsing appendicitis.

Pain, fever, and rigidity of the muscles are the three cardinal symptoms; next in order of importance is the sudden onset, nausea or vomiting, and constipation. The pulse is of little significance as a diagnostic symptom, since it is possible that with the abdominal

cavity filled with pus and fæcal matter, the temperature between 102° and 104° F., as in a case, the history of which was given, the pulse may remain for days below 100. Fever, on the other hand, is a symptom to be relied upon as present in every case, no matter how mild the attack, especially if it be taken per rectum. For several years he had looked upon the taking of rectal temperatures as the only accurate method of thermometry to be employed in all inflammatory conditions of the abdomen or during the presence of shock. He had been surprised again and again at the great disparity existing between mouth and rectal temperatures in certain abdominal conditions and even in typhoid fever.

In reference to treatment, he was firmly convinced that the great majority of cases of appendicitis require surgical intervention.

If for any reason an operation is out of the question, he thought that the proper treatment to pursue should be absolute rest in bed, with diet restricted to beef-tea and water, with a daily enema and flaxseed poultices to the abdomen. Possibly minute doses of morphia hypodermically if the pain be excessive. In the majority of these cases we probably have to deal with a parietal inflammation restricted to the organ itself or possibly a plastic, non-septic peritonitis in the immediate neighborhood of the appendix. Physiological rest of the surrounding structures is indispensable if we wish nature to accomplish good results. But if, on the other hand, a case is seen early, then thorough primary purgation is the proper treatment, especially indicated if there be any doubt as to the diagnosis. If, in such a case, the symptoms be not immediately relieved after several movements of the bowels, the patient is under the most favorable conditions for a cœliotomy. An immediate operation should be urged in every case of acute appendicitis where there is no reasonable doubt as to the diagnosis, especially if it be the first attack and is seen early. The advantages of the total removal of an inflamed appendix not complicated by the presence of pus and the closure of the abdominal wound without drainage, more than compensates the uncertain future course of such a case, and perhaps the necessity of a subsequent operation in the presence of suppuration followed by drainage with its attendant evils, and long and tedious convalescence, an ugly scar, and the increased liability to hernia. The only contra-indication to an operation in any case of acute appendicitis should be a reasonable doubt as to the diagnosis. It is clear, no matter at what stage of the disease that pus has formed, there should be but one course to pursue,

and that is its removal by the proper surgical means. There is but one method of treating a case of fulminant or acute perforating appendicitis, and that is an immediate cœliotomy. Operating upon cases of chronic appendicitis or during the quiescent stage of the relapsing form is attended with so little danger that he would not hesitate to advise patients to submit to it, as in recurring appendicitis the danger to life increases with each successive attack.

In conclusion, Dr. Laine gave the details of eight cases which illustrated the points which he had made in the course of his remarks.

THE PATHOLOGY OF APPENDICITIS.

DR. STENGEL stated that he had found the minute anatomy of the appendix much as it has been described recently by surgeons and pathologists, but there was one point in particular to which special attention might be called,—the richness of the lymphatic structure. Of especial importance is the lymphoid tissue at the mouth of the appendix. The valve of mucous membrane which has been described at this portion of the appendix he had found in most of his cases; and he had looked at this with particular care. In the great majority of persons there is a distinct swelling at the mouth of the appendix, but not a papilla of the magnitude of that found at the orifice of the pancreatic duct. Microscopically this swelling consists of a mass of lymphoid cells arranged in a circular fashion about the mouth of the appendix, and covered with mucous membrane. Throughout the mucous membrane of the appendix the supply of lymphoid tissue is much greater than in any other part of the intestines excepting in localized areas where Peyer's patches or solitary follicles are found.

The blood-supply is particularly rich in the subserous coat, and not rarely the net-work immediately beneath the serosa of the appendix forms the greater part of that tissue, particularly in cases in which there has been some beginning pathological change. The appendicular mesentery, unlike the descriptions which were formerly given of it, extends almost to the tip, or quite to the tip, in practically every instance. This is the condition which is described by most of the surgeons who have reported cases recently. The rudimentary ligament of the appendix, which springs from the cæcum opposite the attachment of the mesocæcum, exists in a number of cases, but he has not found it in the majority of cases. He has never seen in the female subject the appendiculo-ovarian ligament that has been described by some authorities; nor has he seen evidences in

the female of the blood-supply which is described by those who adhere to the view that there is a double blood-supply in woman,—one set of branches being derived from the mesenteric system, the second from the ovarian artery and reaching the appendix through the appendiculo-ovarian ligament.

As far as intestinal stasis or coprostasis as a cause of inflammations of the large intestine are concerned, he would call attention to the fact that the lower part of the colon would be more likely to be inflamed because the fæcal matter does not harden in the upper part of the colon, but usually in the descending colon and in the sigmoid flexure. In these situations inflammations from this cause do occur, and they are not infrequent. In cases of greater obstruction of the fæcal movement, inflammation is set up in the ascending colon as well as in the cæcum, and in two cases of advanced obstruction of the colon, one in an insane patient and one in a case of what may be called giant-colon, that he had had an opportunity of examining post mortem, there were marked inflammatory lesions in the entire length of the large intestine. The spots of atrophy which are so often found in the mucous membrane of the cæcum are further evidence that the cæcum is frequently subject to inflammation,—perhaps more often than we have ever believed, and certainly a great deal more frequently than is believed by some at present. The inflammation of the cæcum in these cases, however, does not penetrate through the walls of the intestine, and set up a perityphlitis and fibrinous exudation on the serous surface, probably for the reason that this part of the intestines is freely movable and does not attach itself closely to surrounding tissues. In fact, it is only in the appendix and in the rectum that inflammations of the mucous membrane tend frequently to perforate the walls and set up inflammation on the outside of the gut.

As far as the appendix itself is concerned, it should be remembered that there are a variety of diseases affecting this organ, though on account of its small size disease beginning in one of its component portions extends very rapidly to other portions, and mixed affections result; but for all that there are different forms of disease, and every affection of the appendix is by no means inflammation.

Recently the speaker examined an interesting case of stenosis at the mouth of the appendix, in which the mucous membrane of the organ showed well-marked signs of degeneration. The glands in the mucous membrane, particularly those near the extremity, showed distinct dilatations of funnel-like form; some were dilated in such man-

ner that it appeared as if there were diverticula. The epithelial cells lining these glands were completely diseased, almost without exception having undergone mucoid degeneration, such as is normal to the lining cells of all mucous surfaces, but not to the extent it existed in this case. At the tip of the appendix there was a large collection which had caused a tumor-like prominence of the appendix, so that looking at it on the outside there was an enlargement the size of a cherry. On section this was found to be a mucous cyst, somewhat like those that occur in the nose. There were no signs of inflammation to the naked eye, or microscopically.

It must be admitted that the richness of the lymphoid tissue makes it difficult to determine when an inflammation has begun. Still, in this case there were no naked evidences of inflammation, no more at least than we should find in many appendices we regard as normal. This was an instance, then, of obstruction of the appendix with slow degeneration of glands and epithelium. Cases of mucous degeneration and cyst-formation of the same character have been described by others (Kelynak, Ribbert, Guttmann). Virchow designated such cases as colloid degeneration of the appendix.

Another form of disease, or another class of affections of the appendix not inflammatory, are the circulatory disturbances. In cases of colitis with distention, or in cases of inflammation of the mucous membrane of the cæcum and colon with swelling around the mouth of the appendix, obstruction of the blood-supply may occur and the appendix may be congested. There results a greater or less amount of swelling, serous exudation, and hardening or "erection," as it has been called. This occurs also as a part of true appendicitis, but the condition is not itself one of real inflammation; it is simply a result of obstruction of the blood-supply, and, though it may lead to subsequent inflammation, may, on the other hand, remain as a simple congestion, and lead to degenerative changes rather than appendicitis. We have to deal with simple passive congestion in such cases, but they must be admitted as rare. Usually such congestion is merely the beginning of appendicitis, and at this point we begin with inflammation.

Appendicitis we must recognize nowadays as a bacterial disease, an infection usually from the lumen of the appendix itself. The bacteria that occur here are the bacterium coli commune, staphylococci, streptococci, occasionally the bacillus pyocyaneus, the pneumococcus of Friedländer, and others. In the investigations of some fresh appendices which the speaker had the opportunity of making, in con-

junction with Dr. Kneass, more being done by Dr. Kneass than himself, the bacillus coli communis was found in almost every case. In some cases they found in addition to this streptococci and the staphylococcus pyogenes albus. They did not find the aureus in any case. Streptococci were found in two cases, the bacillus pyocyaneus in three cases, the pneumobacillus of Friedländer in one. The existence of the bacterium coli commune has been commented on a great deal, but the speaker would maintain that it plays a less important part than some are inclined to attribute to it. He illustrated this point by referring to another sort of case. In a recent typhoid fever patient with very rapid onset and with rapid destruction (death in four or five days) they found that the spleen exhibited colonies of what they feel assured were typhoid bacilli. After twenty-four hours this same spleen gave only a culture of the bacillus coli communis. This is in striking accord with all the investigations that have been recently made, especially by French observers. It would appear that the bacillus coli communis is an organism which grows with great rapidity after death, and crowds out or destroys other micro-organisms. It does not follow, of course, that other forms of micro-organisms are present in every case, but it is probably true that other varieties are present much oftener than simple culture experiments would indicate. The cases of appendicitis which appeared most destructive have been those in which mixed infection was demonstrable, those in which they found the bacillus coli communis and other micro-organisms. This, however, is a mere opinion, and it is by no means certain how much the bacillus coli has to do with any of these cases.

Then they attempted to discover how far this bacillus and other micro-organisms are able to penetrate the wall of the appendix. For this purpose they took the fresh appendices, which were received probably an hour after removal, made cultures from the surrounding exudate, then made an incision or slight puncture through the serous coat after the surrounding exudate had been removed as carefully as possible and without any destruction, and made a culture from the tissues immediately beneath the serous coat. In a great many of the cases cultures were obtained not only of the colon bacillus, but of the other micro-organisms which were afterwards discovered in the muco-pus or pus found in the anterior of the appendix. The results of the cultures from the tissue and from within usually coincided, and they almost habitually found that in cases of appendicitis the bacteria had wandered as far as the serous coat. They have continued these studies by staining sections with thionin and other

stains, and were able to discover the invasion of micro-organisms as far as the muscular or even the serous coat by this method. They were generally not discovered under the serous coat probably because they were very sparse there, and therefore easily overlooked by a method of this kind.

In regard to foreign bodies within the appendix, they are, of course, as is well known now, not absolutely foreign bodies, as was formerly believed. Seeds are less commonly spoken of than formerly; nevertheless he had seen seeds and pins within the appendix which had set up appendicitis. He had seen only recently a fragment of a bone, perhaps a small spicule the patient had swallowed, at the tip of the appendix, and other unquestionably foreign bodies are found now and then. More frequently the "stones" that are found are fæcal concretions and enteroliths which are formed, not within the bowel, as used to be thought, but in the appendix itself. In cases of entero-colitis with obstruction of the mouth of the appendix and perhaps beginning catarrhal appendicitis, the fæcal contents of the appendix with the mucous exudation are prone to form concretions which may add to the existing irritation and aid by their pressure effects the beginning bacterial invasion. In cases of perforation it may again be largely the local pressure of concretions together with the obstruction of the blood-supply and coincident obstruction at the mouth of the appendix that leads to the perforation.

It is of some interest to note that in quite a number of sections of what was regarded as gangrenous appendicitis there were no evidences of gangrene, but rather intense stasis of the blood, enormously-dilated blood-vessels beneath the serous coat, filled with a dark-colored or reddish material, in which individual corpuscles could not be distinguished by the microscope. These are densely-packed blood-corpuscles, which, given the proper release, would again find their way into circulation, with relief of the conditions and without gangrene.

In regard to the symptomatology as bearing upon the pathology of appendicitis, the speaker cited instances of autopsies in cases in which the symptomatology was that of appendicitis, and in which the appendix was not diseased; and he referred to an instance in which the appendix was completely atrophied and the symptoms were those of apparently typical appendicitis. In this case the appendix was more like a thin cord of tissue than anything he could liken it to; it was absolutely without lumen up to the cæcum. The symptomatology, however, was that of appendicitis.

The cases of mild appendicitis he believes very frequently are

simply cases of cæcitis with obstruction of the mouth of the appendix and a certain amount of engorgement, and perhaps of beginning degeneration or catarrhal inflammation of the mucous lining of the appendix; very mild cases, which may, however, without our being able to discover symptoms of an untoward progress, terminate in attacks of most violent appendicitis. The likelihood of the disease beginning in this manner is suggested by the analogous conditions and results following duodenal catarrh.

It is no longer believed that catarrhal jaundice results from inflammation of the bile-ducts within the liver or of the liver structure itself. The potent cause and the essential pathological condition is a catarrh of the duodenum, which obstructs the mouth of the biliary duct. Secondary changes may, indeed, occur in the upper biliary passages, but at first the condition is one of simple obstruction, and the pain is due rather to distention and obstruction than to inflammation. So, too, in beginning appendicitis it is not unlikely that the first symptoms are merely results of obstruction, and their greater severity explainable by the strong muscular coat of the appendix. At this time laxative treatment may relieve the symptoms entirely, and the case may rapidly advance to complete convalescence, but if the obstruction is not relieved, increasing irritation of the wall of the appendix and penetrating infection by micro-organisms within the contents are likely to result.

The speaker again insisted on the point that while he believed and claimed to have seen and found, very commonly, either active or old evidences of inflammation in the cæcum, not tubercular and not typhoidal, such processes never, or practically never, give rise to penetrating inflammation,—that is, to perityphlitis, as was formerly described. He believes perityphlitis should be recognized as an inflammation beginning in the appendix. There may be cases in which it begins elsewhere, but they are rare. The early symptoms, however, are symptoms of appendical obstruction and not of perityphlitis, not even of inflammation of the appendix itself. If the obstruction is not relieved, appendicitis results, and perityphlitis may rapidly ensue.

Dr. J. H. Musser said that Dr. Stengel's statements tallied very closely with his own views derived more particularly from studies from a clinical stand-point.

Clinically he did not believe that catarrhal appendicitis could be recognized. No doubt the symptoms that attend it, if present, may last ten or twelve hours at the longest, but they are followed by

symptoms of infectious appendicitis. Symptoms of appendix disease are due to retention of products within, or to infection of, the appendix. If we study appendicitis from the pathological side, we should always ask the question whether it is one with retention of products of inflammation, or whether it is with free lumen and discharge of the products into the intestine. If there is free lumen, of course, symptoms subside in a very short time, within twenty-four hours. If there is retention, the micro-organisms become pathogenic, and there results an infectious inflammation.

There is a class of cases of appendicitis, chronic in character, in which the appendix is the focus of infection for the remainder of the intestinal tract. Three or four such cases had come under his observation. They present the phenomena during the course of the disease of persistent intestinal catarrh associated with anæmia, with neurasthenic symptoms, with loss of appetite particularly in the morning, with more or less marked intestinal symptoms, with the occurrence probably from time to time of attacks of colic, of appendicular colic, not continuing more than twelve or twenty-four hours and not attended by fever. One such case was under his observation, and his method of reasoning with regard to it was that it was a case of intestinal catarrh associated with catarrh of the appendix. For a short time there was retention of products and intestinal colic. Dr. Musser thought if the intestinal catarrh was cured the other symptoms would end. Therefore he placed the patient on a suitable regimen, put her to bed and carried out the usual methods pursued in cases of anæmia and neurasthenia, and for six weeks she gained in weight and strength, and the removal of mucus from the passages satisfied Dr. Musser that the intestinal catarrh was cured. He was just about to order her out of bed when she had a most violent appendicular colic, which was one of the most severe in a series of attacks extending over four or five years. This at once determined the removal of the appendix. When it was removed it was found to be the seat of infectious inflammation. Dr. Abbott stated that the bacillus coli communis was present. The patient rapidly recovered, not only surgically, but in due course of time all symptoms of intestinal catarrh were removed and the patient was fully and absolutely restored to health, and had not had any neurasthenic or any other symptoms since the operation, which was four or five years ago.

Since then Dr. Musser had had two or three such cases, which demonstrated the possibility that the appendix, though probably

innocent, clinically, may be a focus of infection, from which intestinal catarrh and general morbid phenomena may arise.

As to appendicitis or typhlitis of tuberculous origin. Two or three such cases had come under his observation where it was very difficult to decide whether one had to do with a case of infectious appendicitis, with secondary peritonitis, or whether there was primary tuberculosis. One of the cases operated on turned out to be tuberculosis with tuberculous ulcer of the appendix. In that case the operation was no injury to the patient. The other cases he saw at first baffled actual diagnosis; only by waiting and taking into consideration general symptoms, the loss of flesh, and other phenomena which attend tuberculosis, was he able to make a diagnosis which was borne out by the result of the case.

In one case the local and general symptoms pointed to carcinoma of the cæcum. There were also symptoms of suppuration, as fever. At the autopsy, in addition to cancer of the cæcum a well-marked abscess from disease of the appendix was found.

Dr. James M. Barton remarked that in making the diagnosis of appendicitis, but little attention is usually paid to the temperature, as it varies several degrees in equally well-marked cases. The difference in temperature probably depends quite as much upon the character of the infection as upon the extent of the inflammation, the infection is probably always a mixed one, but the character of the predominating germ may have much to do with the temperature as well as with other symptoms; it may also have much to do with the urgency of the case and the need of early operation.

He had never seen any fæcal mass in the colon, when making a section for appendicitis, nor, indeed, when opening the abdomen for any other condition, even in cases of low-down intestinal obstruction he could not recall that he ever found the head of the colon filled with fæces.

In regard to the tenderness at McBurney's point, he had found it only in about half the cases that had come under his observation, the greatest tenderness being located at the point described by McBurney. There is always an exquisitely tender spot somewhere, but it is often a short distance below, occasionally inside and rarely outside of McBurney's point. In the last case he operated on the greatest tenderness was in the loin; here the appendix was unusually long, ran upward and outward, and the abscess had developed at its extremity. In another case where the tenderness was near the median

line he was able to split the rectus directly over the affected appendix and remove it through quite a short incision. He adopted this route, as long as it was possible, as it greatly lessened the chances of hernia. As to hernia after operations for appendicitis, Dr. Barton thought the percentage to be much greater than 1 per cent. of the cases, particularly in cases operated on five or six years ago; he had seen quite a number of the older cases who had had to be operated on for hernia and a still larger number who wore trusses and refused operation. The percentage is certainly much lessened in late years by the improved methods adopted.

It was stated by one of the speakers that in cases of well-developed localized abscess, it was better not to remove the appendix. He had held this opinion for some years, and about a year ago reported fourteen cases on whom he had operated in this manner. He recently investigated the present condition of eight of the patients (all that he was able to find), none of them had had any trouble with the appendix since the operation and all were in good health. Since then, however, one of them on whom he had operated three years ago had a return, and he removed the appendix on the second day of the attack. Another case on whom he had operated about a year before by simply emptying the abscess, and who was not included among the fourteen reported, also had a return; he removed the appendix on the third day, both patients recovered. He now feels that it is more important to remove the appendix in this class of cases than he thought formerly, but even now in a large, well-developed, localized abscess, unless the appendix was readily found, he would not remove it. To separate infected tissues and search for a deep-seated appendix would be very apt to start a fatal general peritonitis. Dr. Fowler suggests to let the appendix alone in such cases and on recovery to again open the abdomen and remove it. As far as his experience has gone this would be often unnecessary. He advises such patients to keep themselves within reach of surgical interference and on the first evidence of trouble to seek aid. He so advised both of these patients on whom he did a second operation, and on both he was able to operate so early that the risks were not much greater than an operation between attacks.

Dr. Edward Martin referred to a case of enormous pelvic abscess running a course of eight days with absolutely no rise of temperature, yet the case started as appendicitis. In this case, also, there was neither pain nor any of the symptoms ordinarily present in appendicitis. It may be that the rectal temperature may be more

useful than the mouth or axillary. Most surgeons have a tendency not to look at temperature charts, but rather to gauge by pulse, not only its rapidity, but its force and strength.

In regard to the diagnosis of appendicitis, he had seen in the practice of others and also in his own practice a number of affections which gave symptoms identically the same as those which come from the appendix, but which were not appendicitis. He recalled one case of kidney stone with acute hydronephrosis, attended by all the cardinal symptoms, including temperature, which was only diagnosed by making anterior abdominal incision. He had seen in a case of beginning epididymitis symptoms which were practically those of appendicitis. There was temperature, vomiting, and constipation, attended with high fever. He had seen another case of acute spermatocystitis, as diagnosed through the rectum, which gave the classical symptoms of appendicitis. In both these cases, and that was really the guiding point, there was a history of a preceding urethritis. Then he had seen a case of Littré's hernia, where again every symptom of acute appendicitis was present. An abdominal cut showed that a portion of the lumen of the gut was caught in the internal ring, and operation was then made for its reduction. He believed diagnosis of appendicitis to be at times impossible, even though this is exceptionally true, when there is every reasonable probability the proper procedure should be operation.

Dr. John B. Shober presented a specimen of bone which had caused symptoms of appendicitis in a man under his care. As a result of purgatives, the man had large movements, but without any relief at first. But quite suddenly all symptoms had left him, his temperature went down, and the danger seemed to have passed. Shortly thereafter he had a copious bowel movement, which seemed to be obstructed, and on inserting his finger he removed what appeared to be a piece of terrapin bone.

Dr. G. G. Davis said that the removal of the appendix and what we so continually hear as to the results of operations for appendicitis are so extremely favorable that an entirely erroneous impression as to its mortality is produced. One is convinced that the serious acute cases are not reported. We hear the discussions of subacute and chronic appendicitis and of the brilliant results of operative treatment, but of the other cases, the serious cases, the cases which terminate fatally, we hear comparatively little.

As regards operating, he thought no one should hesitate if convinced that he had a septic appendicitis to cope with. Dr. Laine and

Dr. Musser had admitted that catarrhal appendicitis is practically unrecognizable; this being so, if called to deal with an appendicitis, one would not be able to say in a single case that it could be safely treated by non-operative measures. Therefore, on this account, together with the liability to subsequent attacks, he believed in operating on all cases as soon as the diagnosis was positive.

As to the serious cases, there are two questions which present themselves; the saving the life of the patient, and the avoidance of subsequent trouble. Some time ago Dr. Fowler had reported forty-nine cases of appendicitis operated on from the third to the seventh day, with a mortality of twenty-one. That is quite different from that of the subacute cases and those operated on between the attacks. In other words, with a mortality of over 40 per cent., it behooves a surgeon to think whether he is justified in jeopardizing the patient's life by insisting on removing the diseased organ.

As to future trouble when the appendix is left in, some time ago Dr. White, in his monograph on "Appendicitis," had stated that he left the appendix in fifteen times, and in none of them was there any serious subsequent trouble, and in Dr. Barton's cases just reported, although in some of them subsequent attacks did occur, in none of them did death ensue. There was a perfect result so far as life is concerned in all the cases in which the appendix was allowed to remain. Could as much be said had the operator persisted, as has been advised by some, in attempting to remove the appendix? There are some cases in which the operator is only justified in making a puncture to relieve the pus, and Dr. Davis was firmly convinced that one who persists in removing the appendix in every case is going to sacrifice the lives of a certain number of patients who would otherwise have recovered. He thought likewise that the removal in every case, while it may not be impossible, increases the seriousness of the operation to such an extent that it may induce such an operator to refuse operation on certain cases because he thinks they will not stand this severe operation of total removal when they would survive the milder one of drainage.

Dr. John C. Da Costa said that Dr. Davis had given the reason for the low mortality when he stated that there were but few completed operations. In the cases ordinarily met with there is an inflammation of the appendix, around which an abscess forms; the abscess is opened, flushed, and drained, and the patient recovers just as he would from an abscess opened in any other part of the body. During the last

year he had seen quite a number of operations by others for appendicitis, and had taken out several appendices himself, but he had never been fortunate enough to see the appendix removed when an operation was done purely for appendicitis. In two or three of the more serious cases upon whom he had operated during the past year, there were present none of the classical symptoms regarded as characteristic of appendicitis. In two of the worst cases upon whom he personally operated the temperature did not go above 99° F. There was entire absence of pain in the right side, no tenderness at McBurney's point, but in one of the cases there was marked pain in the left side. In the cases in which he removed appendices the cœliotomies were indicated by conditions other than the symptoms of appendicitis.

DR. J. M. DA COSTA said that, practically speaking, there was no such affection as perityphlitis that is not at the same time appendicitis. Another point, and that a pathological point, had occurred to him. Is there nothing back of the inflammatory lesion and the bacillary infection? It is assumed that it is due to the bacillus coli communis; but why could we not also believe that several causes may start up an inflammation and that the bacilli having a living place in the mucous membranes produce a secondary infection? Thus can be classed together the cases that apparently begin with indigestion, which it is impossible to ignore clinically, and also cases that seem to be due to the poison of influenza. The influenza poison is the starting-point of the catarrhal inflammation in many of the cases. If we have an inflammation from this cause we can readily understand how bacilli may act a secondary part; whatever poison or irritation may have started the primary inflammation, the altered secretions attending it would serve as a ready nucleus for augmented bacilli development and infection. Such an assumption will explain many cases. He thought that it was not altogether due to mistakes in diagnosis that we did not know of more cases of appendicitis in the past. The hundreds of cases we hear of now he believes are very many of them due to the present widespread epidemics of influenza. Thus, in the epidemic, the catarrhal influenza influence and the catarrhal lesions which attach themselves to influenza, we may have an explanation of the comparatively much greater frequency of appendicitis. As to the rectal temperature, we must not overlook the fact that the rectal temperature is always higher than that in the mouth or the axilla; even in normal individuals we find a difference of $\frac{8}{10}$° F. or more, and in children $1\frac{1}{2}$° have been repeatedly noticed.

REVIEWS OF BOOKS.

MEDICAL AND SURGICAL REPORT OF THE (BOSTON) CHILDREN'S HOSPITAL, 1869–1894. Edited by T. M. ROTCH, M.D., and HERBERT L. BURRELL, M.D. Published by the Board of Managers. Pp. 367. University Press: John Wilson & Son, Cambridge, U. S. A.

The publication of this report was suggested by the medical staff, "with the view of presenting to the community, (1) the history of an institution organized and maintained for the care of sick and disabled children; (2) in order to show, by the contributions of the members of its medical staff, how much good work had been done, and the most efficient methods known to medical science of accomplishing its object; and (3) of offering carefully-prepared articles, based largely on the practice in the hospital, on various topics of importance in the science of medicine.

"It consists of three divisions,—the administrative, the medical, and the surgical.

"The administration division contains the history of the hospital, a description of the buildings, an account of the executive management, a description of the Convalescent Home at Wellesley, Mass., and an account of the out-door relief department of the hospital."

The history of the hospital, by Dr. Francis H. Brown, with whom the idea of founding the hospital originated, who served for ten years as one of the attending surgical staff, and to whose guiding hand, as secretary of the Board of Managers during the period covered by this report, so much of its success is undoubtedly due, is an inspiring narrative of hospital development, in which the honors appear to be pretty evenly divided between the Medical Staff, the Board of Managers, and the Ladies' Aid Association.

From it we learn that the hospital was incorporated March 22, 1869, for the following objects:

"(1) The medical and surgical treatment of the diseases of children.

"(2) The attainment and diffusion of knowledge regarding the disease incident to childhood.

"(3) A system of voluntary nursing, including moral and religious training, by cultivated and experienced Christian women.

"(4) The training of young women in the duties of nurses."

The hospital was opened July 20, 1869, in a house owned by the association. A new and larger building was leased and occupied from July 28, 1870, until the completion and dedication of the central portion and west wing of its present home, December 26, 1882.

On October 1, 1888, an out-patient building was completed, and during the following year the work of completing the hospital proper by adding the east wing was taken up.

In the mean time the Ladies' Aid Association, which, from the opening of the hospital, had supplied it with linen, bedding, and dressings, besides rendering much other valuable service, had, since 1874, provided a Convalescent Home in the country during the summer months.

During the first three years the home consisted of a rented house, with capacity for six children, a superintendent, and a nurse. In 1877, the home was considerably enlarged by the purchase of an estate in the town of Wellesley, which was occupied until 1890, when thirty-three acres were purchased for $8000, and a new and permanent building erected thereon at a cost of $48,000. This building was opened and dedicated June 16, 1892, the entire cost of the property, including its maintenance, having been defrayed by the Ladies' Aid Association. In March, 1894, an out-door relief department was organized, with a surgeon and trained nurse, "to determine, if possible, whether the nursing and care in their own homes of sick and crippled children who are unable to come to the hospital is feasible and desirable."

The present plant of the hospital consists of a central or administrative building, with wings on either side, containing wards, an adjacent building for the use of the out-patient department, a convalescent home, and an out-door relief department.

The entire hospital building is 318 feet long; the central building 44, the wings each 113, and the out-patient building 48.

The hospital provides accommodations for about 100 and the convalescent home for about fifty patients.

The report of the medical division, covering sixty-five pages, consists of a series of original papers by the members of the staff on the following subjects:

Typhoid fever, the value of milk laboratories for hospitals, the relation of an aural service to the needs of a general hospital for children, malaria in children, an epidemic of scarlet fever, the etiology of chorea, an endemic of diphtheria apparently stopped by the use of antitoxine.

Most of these articles are careful analyses of the histories of large series of cases observed in the hospital. All are short and concise and will well repay careful reading.

The remaining two-thirds of the book are devoted to the surgical report, which consists of three parts.

"PART I.—A description of the work done in the surgical wards of the hospital, in the surgical out-patient department, and in the surgical appliance shop.

"PART II.—A description of the standard routine of procedure in the classes of cases treated at the hospital. In selecting those to be emphasized, the editor has ventured to adopt a principle that he believes to be of value to the true progress of medicine,—that is, the reporting in detail the treatment of the most common diseases rather than recording unique or rare affections. The articles are signed by the initials of the writers.

"PART III.—Original surgical papers on subjects selected by members of the staff."

Part I opens with classified lists showing the relative frequency of medical and surgical diseases at the hospital from 1869 to 1893.

Then follows, in order, descriptions of the organization of the surgical work of the hospital; arrangements for the operating-room, embracing organization, sterilization of instruments, dressings, ligatures, and sutures, hands of operator and assistants, field of operation, etc., in detail; out-patient service; and surgical-appliance shop.

This article is illustrated by photographic views of the hospital wards and a number of the out-patient department rooms. It also contains copies of the various records, measurements, order, admission, discharge, etc., blanks used in the hospital and out-patient departments. Taken as a whole it presents a very comprehensive picture of the operations of the surgical division.

Part II consists of profusely illustrated articles descriptive of the routine methods pursued at the hospital in the treatment of all the more important surgical diseases of children. Diseases of the joints, embracing the spine, hip, knee, ankle, elbow, and wrist, are first taken up. The articles upon the treatment of diseases of the spine, hip, and knee are especially valuable, furnishing complete working guides for what many years of careful study and experiment with the ample material at their disposal has convinced the authors are the best methods of treatment. These articles, as well as many others found in this and the succeeding division, furnish evidence of much original work. The Taylor back-brace and hip-splint, and the Thomas knee-splint, variously modified, are the standard appliances.

Spinal caries (1964 cases) forms $26\frac{8}{10}$ per cent., and hip-joint disease (1402 cases) more than 19 per cent. of the total number of patients which have been treated at the hospital.

"The essential part of the treatment of spinal caries is antero-posterior fixation of the spine, with leverage so applied as to place and support the superincumbent pressure upon the transverse processes, and this is carried out, with more or less completeness, until the patient is cured. Apparatus is modified, abscesses are opened, and extension and counter-extension in bed are applied in special cases. The means for securing antero-posterior fixation of the spine and support of the superincumbent pressure, and for placing that pressure upon the transverse processes, are either—

"(1) Bed-treatment or (2) Ambulatory protective treatment." For bed-treatment the child is placed upon a Bradford bed-frame, modified at times by curving it upward opposite the kyphosis, so that it brings pressure to bear upon the site of the deformity. Sometimes the antero-posterior back-brace is combined with bed-treatment.

"Infants are treated on a frame, with additional fixation secured by a back-brace, or plaster-of-Paris jacket.

"The rule is, however, to keep the patient in bed as little as is consistent with its spine being protected against superincumbent pressure or motion."

For ambulatory treatment a modification of the Taylor back-brace is generally used. Plaster-of-Paris jackets are used for infants and children whose parents cannot be taught to adjust the back-brace; occasionally in the convalescent treatment of the disease; and often for the sake of economy. A few cases of low dorsal caries are thought to be better supported by a plaster-of-Paris jacket than by any other means.

In the acute stage of hip-joint disease rest in bed with fixation by means of the Bradford bed-frame and traction by weight and pulley or the long traction splint is the rule. After the acute symptoms have subsided, the long traction splint with patten and crutches is the routine treatment. Thus fixation is subordinated to traction, the latter being considered of the greatest importance throughout, while the former is thought to be unnecessary after the subsidence of the acute symptoms. While the writer cannot accept the latter view, he heartily commends the use of the patten and crutches, believing them necessary adjuncts to any apparatus yet devised for the ambulatory treatment of hip-joint disease. An ischiatic crutch, consisting of an apparatus similar to the traction splint, except that it is inserted at the lower end into a socket fastened to the shoe, is worn for protection for two years after all symptoms of disease have disappeared.

Deformities, which do not yield to bed-treatment with traction in the line of the deformity, by the aid of the inclined plane, are either forcibly corrected or subjected to osteotomy. The later opera-

tion has been resorted to for this purpose, twelve times with uniformly good results and forcible correction, "done in a number of cases," is considered devoid of danger, provided ordinary care is used. Abscesses are freely incised, curetted, and drained under antiseptic precautions. A few incisions, made with a view of relieving joint tension, have not encouraged the repetition of this measure. A limited number of early excisions have yielded good results, but not so good, it is thought, as would have been secured in the same cases by conservative treatment.

Of thirty-eight excisions, performed between 1878 and 1893, five died from the immediate effects of the operation and thirteen from general causes after the operation. Eleven of these deaths were due to general tuberculosis. Of the remaining twenty, fourteen are known to have recovered. "The known duration of the disease before excision (in these fourteen cases) varied from five months to five and a half years, the average being about two years. The head of the femur was found to be diseased in every case, and the neck in six cases. The acetabulum was diseased in twelve of the cases, and was perforated in four cases. The time which has elasped since operation varied from eleven months to ten years. The results at the present time are, general condition, good in nine cases, fair in three, and very poor in one. Six are left with discharging sinuses."

Amputation following excision has been done in three cases. Two died, a few months later, from amyloid degeneration of the liver and kidneys. One recovered completely.

"Treatment is begun as soon as a diagnosis is established. Where the symptoms are acute, and there is much distortion, bed-treatment is advised. Where there is muscular spasm, traction is employed. Where there is sensitiveness, fixation is used, and protection is regarded as necessary as long as any treatment is indicated.

"In cases where treatment has been undertaken in an early stage, and thoroughly carried out, ultimate recovery, with a useful limb, is confidently expected; but the excellence of the cure depends partly on the thoroughness of the treatment, and partly upon the extent of the tubercular process."

Of the remaining articles embraced in this section that upon club-foot deserves especial mention, as being eminently practical and judicious, while those upon infantile paralysis, lateral spinal curvature, rachitic deformities, flat-foot, spastic paralysis, torticollis, and empyema are scarcely less valuable.

Part III opens with "A Study of Traction in Hip-Disease," by E. H. Bradford and R. W. Lovett, with a view to answering the following questions:

"(1) Does traction distract,—that is, does it draw the head of the femur away from the acetabelum?

"(2) If distraction does occur, under what circumstances does it take place, and what are its limiting conditions?

"(3) Can traction be employed with benefit as a means of treatment in hip-disease?"

The evidence presented is—

(1) Experimental, consisting of experiments in traction on the cadaver and upon living subjects, and embracing in both healthy and diseased joints.

(2) Pathological evidence.

(3) Clinical evidence.

From the evidence presented, the following conclusions are deduced:

"(1) Traction properly applied can and does draw apart the surfaces of the hip-joint, in the cadaver and in the living subject.

"(2) A greater amount of traction force must be applied than has commonly been used in hip-disease. Distraction is less likely to occur in the adult than in the child, and more likely to occur in diseased or disorganized joints than in healthy ones. Distraction is more easy in a flexed and abducted position of the limb than in a position of full extension.

"(3) Pathological evidence demonstrates that the upper edge of the acetabulum and the head of the femur are eroded in hip-disease where traction is not used. In a specimen shown, where traction was employed, this had not occurred.

"Clinical evidence shows the character of the results in routine

hospital cases after the use of traction in the absence of subluxation of the femur, and in the preservation of motion.

"Upon pathological grounds, and in view of the demonstrable results of cases treated by traction, it may be stated that traction may be employed with benefit in the acute stage of all cases of hip-disease."

The remaining articles of this section, entitled, respectively, suggestions as to the causation of knock-knee and bow-legs, tenotomy in spastic paralysis, what is a normal spine? high temperature in chronic joint-disease, and the treatment of infantile club-foot, are all original papers of unusual merit.

As may be inferred from the foregoing synopsis, this report is one of great value, and cannot fail to be of unusual interest to all who are actively engaged in hospital work either as practitioners or as managers.

The paper is excellent, the type large and clear, and no trouble or expense has been spared in producing, what seems to the reviewer, a model book upon the lines laid down in the introduction.

JOHN BION BOGART.

THE FUNCTIONAL EXAMINATION OF THE EYE. By JOHN HERBERT CLAIBORNE, Jr., M.D., Adjunct Professor of Ophthalmology, New York Polyclinic, etc. Royal 8vo. Twenty-one illustrations, ninety-six pages. Philadelphia: The Edwards & Decker Co., 1895.

COLOR-VISION AND COLOR-BLINDNESS. A Practical Manual for Railroad Surgeons. By J. ELLIS JENNINGS, M.D. (University of Pennsylvania). Illustrated. Royal 8vo, 116 pages. Philadelphia: F. A. Davis Co., 1896.

These members of the medical profession, who are forced by circumstances to be self-reliant in all matters pertaining to diagnosis and treatment, will find these two small volumes of more value than will those of their *confrères* who are so situated that patients suffer-

ing from abnormalities of vision can be at once referred to an ophthalmologist.

In the army, in the navy, and in railway corporations, the examination of the eyes is a part of the surgeon's routine work; such examiners will find that these two books supplement each other, and contain directions which are easily understood and satisfactorily applied.

In the work upon the "Functional Examination of the Eye," Claiborne has intentionally adopted a colloquial style of writing which is as acceptable to the reader as to the students for whose instruction the material was originally prepared. It is his purpose to present the subject in such a way that "a student may follow the lines laid down, and perform the examination with scientific and mechanical accuracy, without further instruction." A good description is given of the prisms, lenses, and trial case used, and their relation in practice to the optical principles involved. The chapters upon refraction, astigmatism, and presbyopia deserve especial mention.

The work on color-vision and color-blindness is also singularly lucid in its treatment of the subject. The chapters upon color-blindness, the way in which it may be acquired, and the various tests employed in detecting the condition are, of course, the essential ones of the book. A colored plate explanatory of Holmgren's tests accompanies the text.

H. P. DE FOREST.

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CONSERVATIVE OPERATIVE TREATMENT OF SACCULATED KIDNEY—CYSTONEPHROSIS.[1]

By CHRISTIAN FENGER, M.D.,

OF CHICAGO.

DILATATION of the urinary passages (cystonephrosis, Küster) above a stenosis or occlusion presents remarkable variations according to the character of the pathological conditions which cause the retention of urine above it.

A sudden, complete, acute occlusion of a ureter, as shown by Cohnheim and others experimentally by ligature of the ureter in animals, is followed by only a temporary, medium degree of dilatation above, of the ureter, pelvis, and calyces, often followed by absorption of the urine, atrophy of the kidney, and final transformation of the latter into a small mass of cicatricial tissue, with or without small cysts, from which a dilated, normal-sized, atrophic, or even obliterated ureter leads down to the original place of occlusion.

It requires a slowly-developing, incomplete, or intermittent obstruction for the development of a permanent dilatation of the kidney, a hydronephrosis containing an aseptic fluid, or a pyonephrosis containing an infected fluid,—pus.

Incomplete obstructions caused by pressure on the ureter from without by many different pathological conditions, or by obstruction within from stones, valves, or strictures, do not come within the scope of this paper.

Obstruction by bending and valve-formation at the pelvic end of the ureter, or oblique insertion of the latter on or in a dilated pelvis, has been studied carefully by Simon,[2] and since his

[1] Reported before the Surgical Section of the College of Physicians of Philadelphia, May 10, 1895, and before the Chicago Medical Society, December 2, 1895.

[2] Simon, Chirurgie der Nieren, Vol. II, Stuttgart, 1876.

time by many investigators, Tuffier, Landau, Terrier, Fenger, and others, so that this condition is comparatively well understood at the present time, and the surgical means of treatment in a fair way of development.[1]

Obstruction above the ureter—that is, in or above the pelvis of the kidney, with the exception of those cases in which stones in the pelvis or calyces cause retention and dilatation above—has not been studied, and little attention has been paid to this condition, in all probability because the kidney in these cases has been removed, either by primary nephrectomy or, when a permanent urinary fistula has followed nephrotomy, by secondary nephrectomy at an earlier or later period.

The dawning conservatism in the surgery of the kidney has naturally led to the attempt to save all the "noble tissue of the kidney," as Tuffier terms it, that may still be of use to the organism. It is consequently important to study these obstructions in detail with the hope that we may be able to recognize and, perhaps, find means to remedy the stenosis, instead of sacrificing the organ.

I have found that a non-calculous obstruction may take place in or rather above the pelvis in a similar manner to that which occurs at the pelvic end of the ureter, and for this reason I shall call attention to some points in the pathology of the latter condition.

Valve-formation at the pelvic end of the ureter is always combined with bending or oblique insertion of the ureter in the dilated pelvis, and often with stenosis or stricture of that portion of the ureter which is located in or on the pelvic wall.

I shall first consider the bending or oblique insertion of a non-stenosed ureter. How does this condition develop?

Cohnheim[2] regards it as a congenital anomaly, "Bildungsfehler."

Landau[3] and Terrier believe that the bending is originally caused by descent of a movable kidney. Landau has seen, on

[1] Fenger, Journal of the American Medical Association, March 10, 1894.

[2] Cohnheim, Allgemeine Pathologie, Band II, p. 403.

[3] Landau, Berliner klinische Wochenschrift, No. 18, 1888, p. 366.

the cadaver, that the ureter bends at its pelvic orifice when the kidney is pulled down, because the ureter at this point is held against the posterior abdominal wall by strong connective tissue, and does not follow the moving kidney. He further states that hydronephrosis with patent ureter is more frequently seen in women and on the right side, consequently, under the circumstances, most favorable for a pre-existing movable kidney.

Tuffier[1] was the first to establish conclusively, by a series of beautiful experiments and by careful clinical observations, the exact causal relation between floating kidney and cystonephrosis. He found that when a kidney was made movable, bending of the ureter would take place in more than one-half of the cases, usually a few centimetres below the pelvis, the bend being either angular or sigmoid; this would give rise to gradual obstruction and dilatation above the bend. The cystonephrosis is at first remittent as long as the bend can be straightened, but, later on, as shown in the clinical observations, becomes permanent.

The results of these experiments correspond so well with the clinical manifestations of intermittent hydronephrosis that Tuffier considers nephrorrhaphy sufficient to establish a cure in the majority of these cases. This opinion is based upon nine operations, all of which were successful. In all these cases the kidney was movable.

Simon[2] believes that temporary obstruction from any cause may produce sufficient asymmetrical dilatation of the renal pelvis to give rise to twisting of the kidney on its longitudinal axis, leading to bending, oblique insertion, and valve-formation.

Küster[3] considers the primary cause to be pyelitis; the inflammation causes swelling of the mucous membrane in the ureter and pelvis, the swelling causing relative stenosis and increased pressure from the urine above. This pressure causes

[1] It is self-evident that nephrorrhaphy can be useful only when the bending and valve-formation caused by the mobility of the kidney are not complicated by stenosis, and it may be difficult to be sure of this condition without opening the pelvis or ureter.

[2] Simon, Op. cit.

[3] Küster, Ueber die Sackniere,—Cystonephrosis, Deutsche medicinische Wochenschrift, Nos. 19 to 22, 1888, p. 369.

prolapse, invagination, or folding of the movable mucosa, at or above the pelvic orifice, down against or into the narrower ureter, and thus produces an effective, even if only temporary, obstruction.

Israel,[1] reported by Rosenstein, takes issue with Küster, and states that oblique insertion and valve-formation are often found in perfectly aseptic hydronephroses where pyelitis has not previously existed. (Landau and others.)

All the opinions which have been cited above undoubtedly have their legitimate place and part in the causation of cystonephrosis.

I think that Simon is correct in laying greatest stress upon the asymmetrical dilatation of the pelvis caused by temporary obstruction of whatever origin. Thus a temporary pyelitis (Küster) may lead to a moderate pyonephrosis which is made permanent and progressive by subsequent valve-formation. Furthermore, a movable kidney (Tuffier, Landau, and Terrier) may lead to bending of the ureter, causing a temporary obstruction, followed by asymmetrical dilatation of the pelvis and oblique insertion, and this condition subsequently leads to a progressive aseptic hydronephrosis.

My reason for considering the asymmetrical dilatation caused by slight, temporary obstruction as the main factor in the development of valve-formation is that I have found that temporary obstruction causing valve-formation above the pelvis was followed in a case of pyelitis by a septic cystonephrosis (pyonephrosis), and that in another case, after compression of a ureter from without by a perityphlitic exudate, an aseptic cystonephrosis (hydronephrosis) followed.

I will illustrate the asymmetrical dilatation above referred to by the following figure (Fig. 1), which shows unilateral, asymmetrical dilatation of a canal or tube. The dotted lines a^1 to a^5 represent the increasing dilatation of one side of the wall of the ureter b. Pressure from the contents in the dilated portion will act upon the wall of the tube at d, and will press the upper free end c over against the opposite wall at c^1. Thus

[1] Israel, Berliner klinische Wochenschrift, No. 18, 1888.

it is evident that, upon a certain degree of pressure from fluid in the dilated space, this unilateral dilatation will result in closure of the tube.

The fact that the ureter is ordinarily a narrower tube than

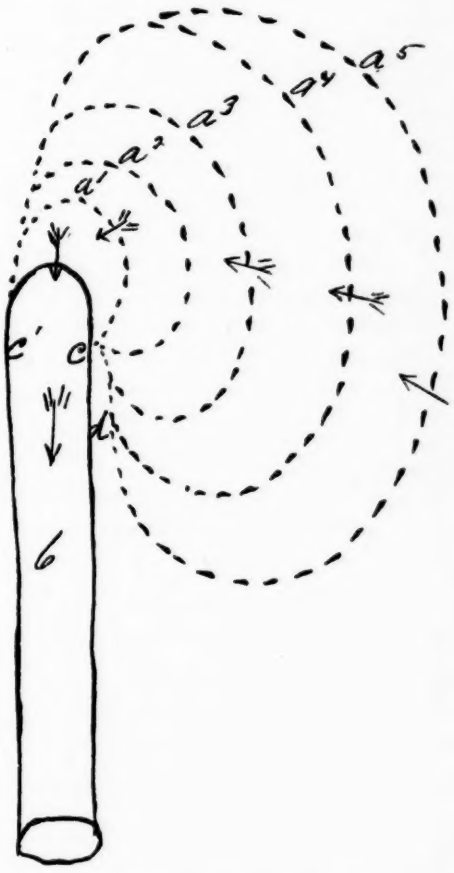

FIG. 1.—Causation of asymmetrical dilatation of a canal or tube (diagrammatic).

the pelvis is immaterial, it even may facilitate the oblique insertion from unilateral dilatation of the pelvis.

In considering occlusion above the pelvis, it is well to remember the variations in the upper end of the ureter, as pointed

out by Hyrtl.[1] In the first variety there is no pelvis, but the ureter divides into two branches without dilatation at the point of division, each branch having a calibre a little larger than that of the ureter. In the second variety there is a pelvis,—that is, a funnel-shaped dilatation at the point of division. The upper portion is the smaller and terminates in three short calyces; the lower and more voluminous portion terminates in four or five calyces. In the third variety there is only half a pelvis,—that is, the lower branch divides and is funnel-shaped, forming a narrow pelvis which terminates in one, two, or three short calyces; while the upper is not dilated and extends to the upper portion of the kidney as a continuation of the ureter. The ureter not uncommonly divides far below the kidney, between the kidney and the bladder; sometimes there is no division at all, and two separate ureters enter the bladder.

Unilateral dilatation and valve-formation may take place in any canal in the body,—biliary passages, œsophagus, intestinal tract,—and inasmuch as not only each branch of the ureter, but also the neck of each of the calyces is a canal, any of these may become the seat of this anomaly. If one of the two main branches of the ureter becomes the seat, retention occurs in the corresponding territory,—that is, in the upper or lower half of the kidney. As the branch to the upper portion of the kidney runs in a straight direction, while the branch to the lower portion goes off at a right angle, the latter portion will probably be more liable to this condition, and, in fact, in both of my cases and in Rayer's obstruction from stone and Israel's, four cases in all, the lower branch was involved. I have not seen or found in the literature any instance of this anomaly in the upper branch. When, on the other hand, the unilateral dilatation begins at the neck of a single calyx, the retention will be limited to the territory of this calyx. It will thus be seen that valve-formation takes place independent of any rotatory movement of a dilating kidney Simon), and that unilateral dilatation is the only condition necessary to this development.

While valve-formation and retention in one of the branches

[1] Hyrtl, cited from Henle's Handbuch der systematischen Anatomie.

of the ureter are probably very rare,—as partial or local hydronephrosis is very rare, seven cases only,—valve-formation and retention at the neck of a single calyx is, I believe, relatively common.

In Rayer's Atlas[1] a number of kidneys with this condition are illustrated, and in my case of pyonephrosis I found not less than three calyces in this condition.

Fig. 2 illustrates schematically unilateral dilatation and valve-formation, at *a*, in the lower branch of the ureter, where the free end of the valve, at *a*, is pushed over to *a'*, and dilatation of a single calyx at *b*, where the end of the valve at *b* is pushed over to *b'*, causing occlusion.

Dilatation of one-half of the kidney, local or partial cystonephrosis, may thus be caused by gradual occlusion of the lower branch of the ureter in the hilus of the kidney (Rayer one case, Israel one case, Fenger two cases), or it may be caused by occlusion of one of the divisions of an anomalous double ureter, as in two cases described by Heller[2] and in one described by Valter.[3]

The first case on record of valve-formation in the lower branch of a ureter causing hydronephrosis was observed by me in 1872 when I was prosector in the Kommunehospital, in Copenhagen.[4]

The patient was a man of twenty, who had, in August, 1872, an attack of perityphlitis, or what is now known as appendicitis, followed several months later by a fluctuating swelling, the size of an orange, in the region of the right kidney. This dilatation was intermittent, as it would disappear suddenly and reappear a few weeks later. Besides this tumor another swelling gradually developed above and below Poupart's ligament, and hectic fever set in. When the patient entered the hospital, two distinct fluctuating swellings were discovered, one up under the liver and the other in the iliac fossa, in contact with each other, but with a distinct groove between them.

[1] Rayer, P., Traité des Maladies des Reins, Paris, 1837.

[2] Heller, Deutsches Archiv für klinische Medicin, Band v, 1869, p. 267; Ibid., Band vi, p. 276.

[3] Valter, cited from Heller.

[4] Fenger, Om den partielle Hydronefrose, oplyst ved et Sygdomstilfälde, Nordiskt Medicinskt Arkiv, Band v, No. 12, 1872.

Exploratory aspiration of the upper tumor evacuated 2000 cubic centimetres of urine, which had a specific gravity of 1007, contained four-tenths of 1 per cent. of urea and no uric acid. The upper tumor disappeared after puncture. Five days later the lower tumor was aspirated and 500 cubic centimetres of fetid pus evacuated. The patient died two weeks later of pyæmia.

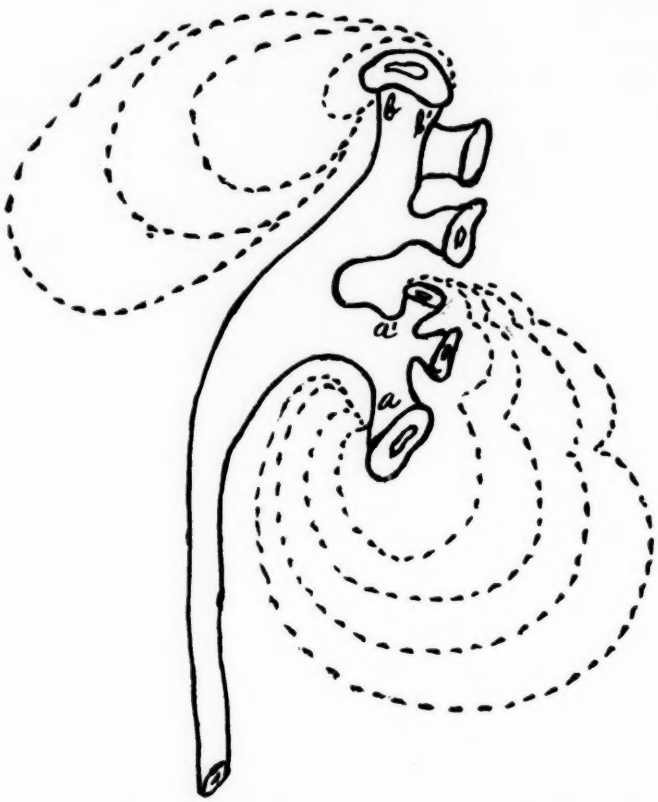

FIG. 2.—Development of unilateral dilatation and valve-formation of the lower branch of the ureter and of a calyx (diagrammatic).

The autopsy revealed septic infarctions and abscesses in both lungs, a large perityphlitic abscess around the cæcum and lower ileum, extending through the iliac fossa down upon the femur. The patient consequently died from pyæmia, following what would now be called appendicitis. The left kidney, ureter, and the bladder were normal.

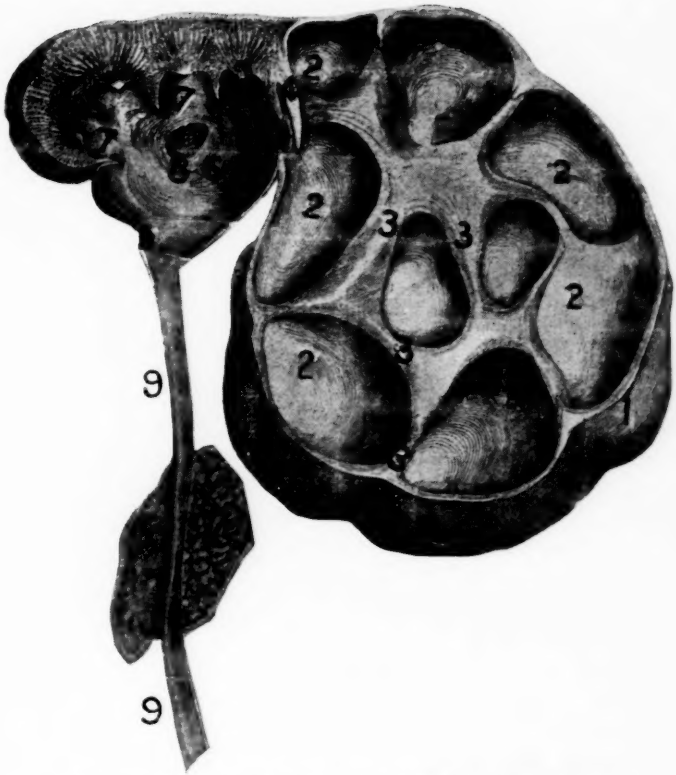

FIG. 3.—Vertical section through a right hydronephrosis with valve-formation, and through kidney and ureter. (One-half normal size.)

1. Hydronephrotic sac.
2. Cavities of dilated calyces surrounded by
3. Semilunar partition walls, one of which forms
4. The valve which covers from below and closes
5. The opening up into
6. The somewhat dilated upper branch of the ureter, —that is, the pelvis of the upper two-thirds of the kidney.
7. Calyces.
8. Entrance to a calyx from the pelvis.
9. Ureter somewhat narrowed or compressed in its course through
10. The perityphlitic abscess.

The right ureter passed through the perityphlitic abscess and was somewhat narrowed in this territory, but still admitted a grooved director. Pressure on the upper half of the kidney and the somewhat dilated pelvis caused urine to pass without difficulty down through the ureter. Pressure, however, on the hydronephrotic sac of the lower half of the kidney did not result in the passage of a drop of fluid. The ureter above the perityphlitic abscess was slightly dilated and led up to a pelvis dilated to the size of a hen's egg. This pelvis belonged to the upper two-thirds of the kidney. In this part of the kidney the kidney tissue was slightly compressed, as the papillæ were somewhat flattened and the pyramids shorter and broader than normal, while the cortical substance was of normal thickness. The kidney tissue in this locality was healthy with the exception of two septic infarctions the size of peas.

The lower third of the kidney was occupied by a large hydronephrotic tumor, a thin-walled multilocular sac, the size of a child's head, which contained 750 cubic centimetres of light-yellow, clear fluid. On its posterior wall was the puncture-opening surrounded by ecchymoses, and close to this point was a fresh coagulum, the size of a walnut. The upper, posterior portion of the sac, which was in connection with the kidney showed a round opening one centimetre in diameter leading up into the pelvis of the upper two-thirds of the kidney. This opening was covered by a valve five centimetres broad and one and a half centimetres high, which hung over the opening like an upper eyelid, and closed it when the sac was filled with fluid. When, on the other hand, fluid was injected into the pelvis through the ureter, it opened the valve and opened and filled the hydronephrotic sac. The valve was semilunar and was formed by the partition wall between two calyces. The inner wall of the sac was smooth and showed an inner layer of atrophic kidney tissue one-half to one millimetre in thickness, in which only a few uriniferous tubules and glomeruli were visible upon microscopical examination. The outer layer was two to three millimetres thick, and was composed of firm connective tissue.

It is evident that the valve-formation in this case, which was located in the lower branch of the ureter, had for its primary cause the incomplete and temporary compression of the ureter by the perityphlitic abscess. This led to moderate dilatation of the ureter and of both of its branches. The valve-formation in the lower branch then followed as a secondary effect, and

this gave rise to a gradually-increasing, intermittent hydronephrosis of the corresponding lower third of the kidney. This hydronephrosis remained uninfected despite the pyæmia, because there was no pre-existing infection of the mucosa of the urinary tract.

That an entirely similar valve-formation may take place from temporary obstruction caused by pyelitis, which may lead to a similar partial cystonephrosis, but, as we would naturally expect, with infection of the contents and consequent formation of a pyonephrosis, is well illustrated in the following case, in which valve-formation occurred in all of the three places which I have pointed out above as the seat of this condition,—namely, the ureteral end of the pelvis, one of the two branches of the ureter (in this case again the lower branch), and at the necks of the calyces, in one of which the occlusion was complete.

Synopsis.—Gonorrhæa, May 29, 1893, followed by posterior urethritis. Renal colic on right side, November 7. Tumor in right kidney, November 20. No colic from December 7 to March 4, 1894. Colic from March 8 to 11; large tumor; high fever. Lumbar nephrotomy March 11. Three weeks later, about 250 small, round stones, the size of a shot, passed through the fistula; complete obstruction of ureter from right kidney for eight days. Ureter then open for ten days, proven by injection of pyoktanin. March 30, ureter again closed; lumbar renal fistula discharges thirty ounces in the twenty-four hours. September 16, operation for oblique implantation and stricture of pelvic end of ureter; persistence of urinary fistula secreting twenty-five ounces in twenty-four hours. January 22, 1895, sudden attack of colic from pyelitis in left kidney, lasting for two weeks. April 13, operation for sacculated right kidney; bisection of kidney. During the summer of 1895 one-eighth of the urine passed through ureter, seven-eighths through the lumbar fistula. August 17, operation for reunion of bisected kidney. September 17, three-fourths of the urine passed into the bladder. November 30, 1895, fistula closed. Fistula reopened January 5, 1896, and finally closed January 15.

Case I.—Mr. D'O. H., a medical student, twenty-one years of age, consulted me on June 22, 1894. Family history negative; no tuberculosis in family. Patient had the ordinary diseases of childhood.

On May 29, 1893, he contracted gonorrhœa, which ran a some-

what typical course. A month later, as a result of excessive exercise, intemperance and neglect, he suffered intense pain of a spasmodic character at the neck of the bladder on micturition. This was diagnosed as inflammation of the neck of the bladder, and persisted until August. From this time on there was no pain in the bladder or on micturition, but a slight discharge from the urethra continued until November 10.

On November 7, while in Philadelphia, pursuing his studies, he had a sudden severe attack of right renal colic which lasted seven hours. Examination of the urine at this time revealed marked hæmaturia, a thick, reddish sediment, and a large amount of pus. Four days later he was removed to Presbyterian Hospital, where he remained under treatment for four weeks, during which time he had recurrent attacks of renal colic lasting from three to ten hours every other day. The hæmaturia disappeared after five days, but the urine contained large amounts of pus, varying from half an ounce to two ounces to the pint of urine, phosphates in abundance, no uric acid, no casts, no sugar.

November 20, the patient consulted Professor Martin, who could detect no marked tumor in the region of the kidney, but considered that there was probably a calculus impacted in the ureter and advised patient to go home, rest, and adhere strictly to diet and flushing. At this time he was emaciated, anæmic, and had sustained a diminution in weight from 148 to 130 pounds.

The patient then returned to his home in Milwaukee and placed himself under the care of Dr. I. Mendel. Under enforced rest and rigid diet the pus in the urine slightly decreased during the next four weeks. He then had a severe diarrhœa which persisted for six weeks, whereby his weight was reduced to 120 pounds, and he was in a wretched condition of body and mind.

On February 1, 1894, he returned to Philadelphia and entered Presbyterian Hospital, in the service of Drs. Musser and Martin. He steadily improved, gained in strength and weight, but the pus in the urine increased in amount.

March 8 he had a severe attack of renal colic, which persisted for three days. The patient suffered intense pain; temperature 101° to 104° F.; pulse 110 to 140; had a large, hard tumor on the right side.

On March 11, Dr. Martin made a lumbar nephrotomy, with the idea of removing the kidney if it should prove to be tuberculous, and of securing drainage through the fistula if tuberculosis did not exist. The operation occupied twelve minutes. The lower two-thirds of

the kidney was found to be dilated and the large sac contained about two pints of urine and pus. The upper third of the kidney contained good secreting tissue. No calculi were found, no tuberculosis. The patient's condition did not warrant prolonged manipulation or search for the ureter.

For the first eight days no urine passed from the right kidney to the bladder, but for ten days thereafter the right ureter was patent, as was proven by the presence of pyoktanin, which had been injected into the fistula, in urine passed by way of the bladder. The ureter then closed and its patency could not be re-established. Three weeks after the operation a large number of small, well-formed calculi, about the size of No. 6 shot, aggregating about 250, were passed through the fistula. The patient wore a silver urinal and passed through the bladder about thirty ounces of urine in the twenty-four hours.

On June 22, the patient came to Chicago, and in August I examined him, and he entered Passavant Memorial Hospital preparatory to operation for obstruction of the right ureter, presumably from calculus at the pelvic orifice.

First Operation.—September 17 I operated in the following manner: Ether was administered by Dr. S. C. Stanton. The granulation tissue at the fistulous opening was removed with the sharp spoon. An incision was then made in the lumbar region through the fistula downward and forward through the skin, fascia, abdominal muscles, quadratus lumborum, and transversalis fascia. The perirenal fat which presented in the wound was separated by forceps from the anterior and inferior surface of the kidney, which was thus laid bare. The incision was prolonged downward two inches. The surface of the kidney was normal in color, the kidney enlarged and lobulated. The adhesions were slight and were easily broken up. The pelvis was now laid bare and found to be dilated. Search for the ureter was now made and it was recognized below its pelvic origin. The pulsation of the renal artery could be felt in front of the ureter. The ureter was now exposed for about an inch and a half from the pelvis. An aspirator needle was introduced into the dilated pelvis of the kidney and thin, bloody fluid withdrawn. The pelvis was now opened on its posterior surface, the contained fluid evacuated, the wound thoroughly flushed with warm, sterilized water and sponged dry.

A futile attempt was made to locate the pelvic orifice of the ureter from the pelvis. A small depression, however, was noticed, which was later shown to indicate the point of entrance.

A longitudinal incision was now made in the ureter about an inch from the pelvis, below the stricture; a flexible sound introduced through this incision passed easily down into the bladder. The lower portion of the ureter was somewhat contracted from disuse. A silver uterine probe was next introduced through the incision and passed upward; the location of the stricture was thus found to be at the point where the ureter emerges to form the pelvis. With considerable difficulty a fine, silver probe could now be pushed through the stricture into the pelvis. With the probe as a director a longitudinal incision was now made through the stenosed portion of the ureter between the two openings. The upper and lower borders of the wound were brought together by silk sutures, thus folding the ureter upon the pelvis, as described in a previous article.

The small, longitudinal opening in the ureter was left unsutured.

Before closing the wound in the pelvis an incision was made through the convex outer border of the kidney into the dilated calyces, and the upper end of a flexible bougie, which had been previously passed down into the ureter through the opening in the pelvis, was passed up from the pelvis through the convex surface of the kidney and out of the lumbar wound, to remain twenty-four hours, and then be removed. A piece of kidney tissue was also removed for examination. Hæmorrhage was controlled by the Paquelin cautery.

Early in the operation, while a digital exploration of the old sinus was being made, a small piece of rubber drainage-tube, left in at the time of the first operation and evidently forgotten, was removed.

The kidney was thoroughly explored for stones, but only one small calculus, four millimetres in diameter, was found and removed.

Drainage-tubes were inserted in both openings on the convex surface of the kidney and one in the bottom of the wound, the perirenal space, and around these gauze was loosely packed. The external wound was closed by uniting the transversalis and internal oblique, and then the external oblique muscle by interrupted silk sutures, and then the skin and superficial fascia by a continuous silk suture. Time of operation, two hours and a quarter.

Microscopic examination of the piece of kidney tissue cut out through the entire thickness of the convex surface of the kidney to its inner surface shows the following: On the inner surface nearest the calyces is a brim of young granulation tissue in which here and

there a straight canal and a glomerulus is seen. This brim forms one-third of the thickness of the kidney wall and terminates in a rather sharply defined line. The remaining two-thirds of the kidney wall from this point to the convex surface shows almost perfectly healthy kidney tissue.

The epithelium in the straight and convoluted tubules is everywhere present and almost normal. A somewhat granular appearance is present, which is probably due to the preparation of the specimen, as another specimen shows normal epithelium. The glomeruli are mostly normal, and only here and there is seen a small island of embryonal cells (interstitial nephritis). This would tend to show that at least two-thirds of the kidney tissue is available for secretory function, and this corresponds well with the twenty-five ounces of urine excreted in the twenty-four hours through the lumbar fistula.

The patient made a good recovery from the operation, but the fistula persisted, and all the urine from the right kidney passed out through the lumbar wound. He returned to his home in Milwaukee, but made monthly visits to Chicago for examination by me and urinalysis by Dr. C. W. Purdy. Marked improvement in the size of the kidney and in the quality of the urine occurred. From twenty-five to thirty ounces of urine were passed through the fistula in the twenty-four hours.

On November 30, the patient had gained thirty pounds in weight, had no pain, passed through the fistula twenty-five to thirty-five ounces of urine, and through the bladder eighteen to twenty ounces of urine daily. Pus was present in the urine, but in small amount only. The patient's general health was excellent. He had an enormous appetite, and, as he said, "would not know anything was the matter were it not for the fistula."

January 22, 1895, the patient had a sudden attack of colic on the left side, accompanied by hæmaturia and pyuria. This was entirely unexpected, as the left kidney had up to this time been regarded as healthy. This new development, of course, rendered extirpation of the right kidney out of the question. This attack lasted for two weeks. The patient came immediately to Chicago, and re-entered the hospital. The symptoms yielded to therapeutic measures, and the patient's condition materially improved.

On March 19, Dr. Purdy made the following analysis of urine from the right and left kidney:

Right Kidney.—Color, milky; specific gravity, 1010; reaction, slightly acid; quantity in twenty-four hours, twenty-five ounces;

urea, two and a half grammes per ounce; total urea, 494½ grammes; albumen, 6 per cent. bulk measure; sugar, absent; casts, none; pus, 1 per cent. bulk measure; blood, none; bacteria, none.

Left Kidney.—Color, normal; specific gravity, 1020; reaction, strongly acid; quantity in twenty-four hours, forty-three ounces; urea, eleven and a half grammes per ounce; albumen, trace; sugar, absent; casts, none; pus, small amount; blood, none; bacteria, none.

Remarks Prior to my Second Operation.—I had seen at the time of the previous operation that the condition was one of sacculated kidney, and had opened three or four of the sacs, which varied in size from a walnut to that of a hen's egg, from the surface of the kidney. These sacs I found to be filled with pus, and in one of them I discovered a small calculus.

I had opened the slightly-dilated pelvis from behind in order to look into it, but could neither see nor find the pelvic orifice of the ureter. I could see a small depression, but, as there was a very narrow stenosis, could not pass a probe down into the ureter.

I had opened the ureter by a longitudinal incision one inch below the pelvis, and passed a probe through this incision up to the pelvis, finding at the entrance a narrow stenosis, almost a complete occlusion; the lumen at this point was from one-half to one millimetre in diameter.

I had performed my plastic operation for stenosis as described in the *Journal of the American Medical Association*, March 10, 1894, Case II and figures, page 26. I had left the small longitudinal opening in the ureter to heal without suture.

I had brought out an elastic bougie passed into the ureter through the opening in the pelvis and out through an opening in the convex surface of the kidney, and this bougie remained *in situ* for two days.

After the operation, blood, pus, and injection fluid passed into the bladder for a short time only; later on all the urine passed out through the renal fistula.

The lack of success of the operation may have been caused by the failure to make a sufficiently large opening at the pelvic entrance of the ureter. This failure may have been due to cicatricial contraction around the upper end of the ureter from con-

nective-tissue masses surrounding the seat of the former incision in the pelvis and the stricture of the ureter, or to the fact that the sutures did not hold, and the opened stenosis of the ureter together with the incision into the ureter through the stricture hung down after the sutures gave way, and by retraction of the cicatrix the stricture formed again, as the folding of the ureter upon the pelvis would then, of course, have been again undone.

A second cause might have been in the kidney itself. The arrangements of the sacs with narrow entrance openings (see Fig. 4, *a*), often not wide enough to allow the passage of a finger or a urethral sound, and in addition valvular arrangements of the separation walls between the sacs, such as I described more than twenty years ago in a case of partial hydronephrosis.[1]

This condition, if the ureter was patent, would permit the urine and pus from the kidney below the valve to pass through the fistula, and only the urine and pus above the valve to pass down into the bladder. (See Fig. 5.)

Plan of Operating.—In order to guard against insufficient communication between, and evacuation of, the sacs into the pelvis of the kidney, I proposed to open the narrow entrances to the sacs,—that is, to transform the multilocular sacculated kidney into a unilocular sac with free evacuation into the pelvis of the kidney. This would have to be done from the convex surface of the kidney by opening the sacs one by one until all were transformed, so that a cross-section of each sac would show the opening of the sac to have a diameter equivalent to that of the sac at its centre. In other words, to transform each sac into a semi-sphere. (See Fig. 4, *b*.) This was especially necessary for the sacs situated in the lower third of the kidney, where, as I had previously found in an operation for stone in the kidney, the body of the sac is dependent from the lower end of the pelvis and the narrow entrance high up, the sac being flask-shaped. In the case referred to the sac contained stones small enough to pass out through the opening, had the position of the sac allowed. The stones, however, remained in the sac because the patient was never inverted for any length of time. My plan was therefore to

[1] Fenger, Op. cit.

open all the dilated calyces, even if it should prove necessary to bisect the kidney,—that is, to divide it longitudinally into two halves down to or into the renal pelvis.

If the stenosis of the ureter at its pelvic orifice had reformed,—that is, if the stricture had contracted, or if valve-formation from cicatricial, extra-ureteral contraction had taken place,—I proposed to repeat my former plastic operation for stricture or valve-formation, or to resect the stricture and implant the unfolded upper end of the ureter in the pelvis by Küster's method.

The patient's symptoms for the previous six months appeared to me to indicate that the ureter was patent, although the patency might be imperfect, and that the localized hinderance to the exit of urine was in the kidney or the pelvis above the ureter.

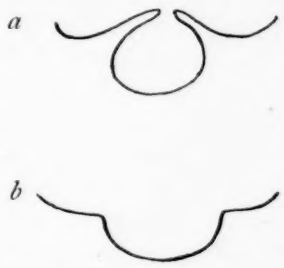

FIG. 4.—Shape of sac before and after division of partition wall (diagrammatic).

Second Operation.—On April 13, 1895, I operated at the Passavant Memorial Hospital in the presence of the doctors from the Polyclinic, and with the assistance of Drs. Brown, Brougham, and Bluthardt; Dr. Waters administered the ether. The patient was placed on the left side with a cushion under the left loin. After the granulations around the fistula had been scraped off, an incision five inches long was made through the fistula and the old cicatrix down into the sacculated kidney. The kidney was loosened from the cicatrix and the abdominal muscles down along its posterior surface until the pelvis of the kidney was reached. I now searched for the ureter, but after half an hour or more was unable to find it. I therefore determined to first bisect the kidney down into the pelvis and search for the ureter from within the pelvis.

I now proceeded to bisect the kidney and operate upon the calyces in the following manner: I first made a longitudinal incision from the opening at *A*, Fig. 5, downward and upward on the middle of the convex surface of the kidney. By so doing I opened a cavity whose wall was composed of friable kidney tissue, three or four millimetres in thickness on the convexity of the sacs, and eight to ten millimetres in thickness in the partition walls between the sacs, the wall becoming thinner again near the entrance to the sacs. This

kidney tissue bled profusely, and there was abundant arterial hæmorrhage from the vessels in the partition walls. The kidney tissue was seared and the partition walls divided with the Paquelin cautery, which stopped the hæmorrhage from the small vessels. The spurting from the larger arteries, however, was so violent that I was obliged to clamp with forceps and ligate many of the thicker partition walls step by step with catgut mass ligatures. The openings to some of the sacs were large, but others were so small as to permit the passage of my little finger-tip only.

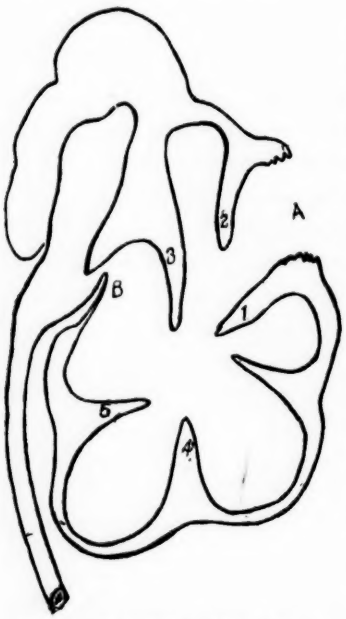

FIG. 5.—Sacculated kidney, Case I. (Diagrammatic.)

After having thus divided partitions *1*, *2*, *3*, *4*, and *5*, I believed that I had reached the pelvis, as I found a narrow opening at *B*, which I thought might lead down into the ureter; but I was unable to pass down either a silver probe or an elastic bougie. I now began a second search for the ureter from below the kidney. By blunt dissection I worked downward towards the outer wall of the renal pelvis, and came upon the vermiform appendix extraperitoneally. The appendix was as thick as a lead-pencil. I finally found the ureter and isolated it for one to two inches below the kidney. The pelvis was cone-shaped and was not much dilated. Upon making traction on the ureter I could detect no movement in what I had supposed from above to be the pelvis, nor could I pass a sound or bougie through the opening at *B* down into the ureter. This opening was so small that it would not permit the passage of the end of my little finger, but a probe passed down through it into a wider space below. I now dilated the opening with a large artery forceps until I could pass my little finger down into the cavity, which was one inch deep in a medial direction and two inches long laterally and upward.

I then divided the partition walls on Kocher's sound with the Paquelin cautery and passed mass ligatures to control the hæmorrhage from the arteries. The pelvis was now open. The wall was whitish,

in contrast to the reddish wall of the calyces. The mucous membrane on part of the wall was thickened and covered with small, flat warty excrescences (état mamelonné).

The opening into the ureter was visible, and the ureter patent. A silver probe and elastic bougies, Nos. 16 to 20, easily passed down into the bladder. This showed conclusively that the former operation for stricture of the ureter had been entirely successful as far as the re-establishment of the patency of the ureter was concerned. I could now pass an olive-pointed bougie easily down into the ureter along the posterior and the two lateral walls of the pelvis, but on the anterior wall, corresponding to the band encountered in the previous operation, a transverse fold arrested the end of the bougie. Thus in order to make the entrance to the ureter still more funnel-shaped I made a plastic operation,—that is, incision with transverse union of the wound, on the anterior and posterior borders of the ureteral opening. I now inserted an elastic bougie, No. 16, to remain for twenty-four hours.

After inserting a rubber drain surrounded by sterile gauze in the kidney I proceeded to close the wound. I partially sutured the wound on the convex surface of the kidney, leaving a large opening for drainage. I then packed gauze on the medial side, below and on the lateral side of the kidney, united the divided muscles by buried catgut sutures, and finally united the external wound with silk.

Towards the end of the operation the pulse became weak, but was slow, and camphorated oil was twice injected.

The operation lasted two hours and a half. Considerable hæmorrhage continued in spite of the Paquelin cautery and mass ligatures. In future, in a similar case, I should stop the hæmorrhage by continuous suture of the wounds in the partition walls.

Four hours after the operation the patient was awake, the body warm, pulse 150, weak, nose cool. Nine hours after the operation the patient was awake, could speak strongly and clearly, said he felt better and less weak than four hours previously. Pulse 150, weak, not much pain excepting on vomiting, when he felt pain in the wound. Considerable bloody fluid soaked through the dressing onto the bed. The patient lay on his right side. I did not consider that he was losing too much blood because the conjunctiva and lips were red, the feet cool, but he had only a sheet over them, and he was not restless. Whiskey and milk were now injected into the rectum. The patient had not yet passed water. He had had a subcutaneous injection

of strychnine. The shock was considerable and the hæmorrhage profuse, the latter because the kidney tissue was healthy.

The cause of the passage of all or almost all of the urine through the fistula lay not in the ureter or the pelvis, but in the kidney itself, in the sacs with valvular arrangements of their partition walls and narrow openings into the sacs, and also in the valve-formation in the lower branch of the ureter at *B*, Fig. 5. This caused much dilatation in the territory of the lower branch due to valvular obstruction of this territory,—namely, the lower two-thirds of the kidney, while only slight dilatation of the territory of the upper branch was present because this was dilated only from the stenosis in the ureter.

After-Treatment.—April 14. The patient urinated once, passing eight ounces of urine, slightly colored with blood. Nausea still continued and stimulant enemata were frequently repeated. The kidney was irrigated with boric acid solution.

April 15. During the night the patient experienced a strong desire to urinate, with a sensation along the ureter as if urine were passing into the bladder. He could not urinate, but five ounces of urine were withdrawn with a catheter. In the morning the patient passed ten ounces of urine, and from this time on no bloody urine was passed. The dressings were saturated with slightly bloody urine. The permanent bougie was removed from the ureter and one strip of gauze around the drainage-tube was removed.

April 16. The patient complained of great soreness, and movements of the body were painful and difficult. All the gauze drains were removed; their removal was attended by excruciating pain. The wound was irrigated and a light gauze packing introduced.

April 17. Dressings saturated with urine and very offensive pus. The offensive discharge came entirely from the drainage-tube in the kidney. The wound was dressed again in the evening, and at this time and for the next two days the discharge of offensive pus was profuse.

April 20. The discharge of pus was still profuse, but less offensive in odor. The drainage-tube in the pelvis and the stitches were removed. The patient felt stronger and the appetite increased.

The offensive odor emanating from the wound persisted until the time of the next operation, August 7. The offensive odor and discharge were attributed to infection from the catgut sutures in the kidney.

Six weeks after the operation, in order to test the patency of the ureter, I introduced a small filiform elastic bougie through the lumbar fistula into the pelvis and down through the ureter into the bladder. This procedure I repeated every second or third day, allowing the sound to remain from half an hour to an hour, gradually increasing the size of the bougie until finally a No. 5 English olive-pointed bougie was used. After each dilatation, and sometimes from twenty-four to forty-eight hours thereafter, pus and urine passed through the ureter into the bladder. This systematic dilatation of the ureter was carried on for three months. At the end of this time about one-eighth of the urine from the right kidney passed down through the ureter and about seven-eighths were discharged from the lumbar wound and the sinuses which had formed along the line of incision in the lumbar region.

On August 7, Dr. Buffum examined a specimen of urine from the bladder, which was supposed to contain some of the urine from the right kidney, and made the following report:

Specific gravity 1014; sediment, flocculent; albumen, trace; blood, a few red corpuscles; pus, large quantity; epithelium, a few columnar cells.

In a specimen of pus taken from the fistula at the same time, Dr. Buffum found the bacillus pyocyaneus. During this time the patient's condition was fairly good considering his long residence in the hospital, the great discomfort and pain in the wound, and the depression incident upon the hot weather.

As there seemed little prospect of a change, I decided upon operating for the closure of the fistula by reunion of the bisected kidney, and for the division of any partition walls that might have been left at the time of the previous operation.

Third Operation.—On August 17 I operated in the following manner: The patient was anæsthetized with A.-C.-E. mixture. The anæsthesia was difficult and the patient vomited during the operation. The granulations in the wall of the fistula were first scraped off and an incision then made through the cicatrix into the kidney. Inspection of the bisected kidney showed that three sacs containing pus and urine still remained. Two sacs were successively opened and divided with the Paquelin cautery, which was also employed to check the hæmorrhage. Only one large vessel required ligature. A flexible bougie, No. 7, French, could now be passed down with some difficulty into the ureter.

In order to unite the bisected kidney, the dense adhesions to

the abdominal wall were separated. While thus isolating the organ, a third sac was opened. This sac had evidently entirely closed and the contained fluid was under considerable pressure, for when a small incision was made in its wall, a jet of pure urine spurted out, and foul-smelling pus afterwards flowed slowly from the opening. After free division of the partition wall, and thorough irrigation, the separation of the kidney from its adhesions was completed. The kidney was now united with fine catgut with the exception of an opening one-half a centimetre in diameter for an elastic bougie passed into the ureter to remain for twenty-four hours, and an opening for a small drainage-tube in the kidney.

The wound was closed and dressed in the usual manner. The operation lasted an hour and a half; the shock was severe. The patient had severe nausea, but no vomiting after the operation until the fourth day.

August 21. Accumulation of mucus in the throat caused slight vomiting, which brought on a slight hæmorrhage from the wound and caused the superficial stitches to tear out, and also, as I afterwards discovered, caused the stitches on the convex surface of the kidney to tear out, leaving an anterior fistula which remained open until November 30.

The gauze drain was removed at the time of the first dressing and the bougie was withdrawn from the ureter at the same time. The wound was thoroughly irrigated with boric acid as in the previous operation, and for the first two weeks and a half a considerable discharge of *débris*, urine, and offensive pus was brought out with the irrigating fluid. The offensive odor gradually decreased until in the third week it entirely disappeared. From this time on the irrigation showed a marked decrease in pus, and at the end of the fifth week the urine was apparently aseptic.

On September 17, after many unsuccessful attempts to pass a bougie into the ureter, William Kessler succeeded in passing a No. 10 French with the greatest ease. The ureter was sounded every day thereafter, and as a result about three-fourths of the urine now passed down through the ureter into the bladder. The drainage-tube remaining in the pelvis was now withdrawn and the fistula allowed to close.

October 3. No distention of the kidney could be felt upon pressure, but there was still a slight discharge of pus from the fistula. About seven-eighths of the urine at this time passed into the bladder. The patient's general health was good, and his condition much im-

proved since the last operation. The quantity of urine discharged through the lumbar opening rapidly diminished, and on November 30 the wound and fistula closed.

From this time on the patient had excellent health until January 3, 1896, when, as a result of excessive drinking at Christmas time, he had a sudden violent attack of colicky pains in the region of the right kidney, with reflected pain down Poupart's ligament into the right testicle. The pain steadily continued for seven hours, when it became necessary to administer morphine hypodermically. At one point in the cicatrix there was extreme tenderness which increased day by day until an abscess finally opened. The urine passed during the night of the attack appeared normal, but on the next morning it changed to a murky, dark chocolate color, with a marked fetid odor, and, upon examination, was found to contain large quantities of pus. The urine showed these characteristics for a few days, there being sometimes three ounces of pus in twelve ounces of urine. After this time the pus decreased and the urine improved in character and color. On the second day after the attack the patient came to Chicago and consulted me. On the same night the abscess opened spontaneously with great relief to him. A drainage-tube was inserted. The bladder was filled with boric acid solution through the kidney opening, thus demonstrating the patency of the ureter. From this time on the symptoms gradually decreased, the pus soon disappeared, and on January 15 the fistula finally closed. The patient has been perfectly well up to the present time, April 10.

On April 22, I received the following report from the patient: Since January 15 no interference or treatment of any kind, and even under pressure of constant work since February 1, I have never experienced better health or greater strength. Appetite excellent; sleep sound; physically stronger than ever; wound occasions not even the slighest inconvenience; kidney exhibits no symptoms of pain whatsoever, neither in rest nor during greatest exertion, such as running up or down four or five long flights of stairs. Right side feels as sound as left. I am careful of the existing hernia in the anterior and lower part of the incision on the right side. Weight 155 pounds, stripped. Uranalysis made by Charles H. Miller shows the following: Quantity 1700 cubic centimetres; reaction, acid; clear; specific gravity, 1016; total solids, forty-eight grammes; sugar, absent; albumen, two grammes daily; blood and bile, absent; urea, 22.1 grammes daily.

Remarks.—The course of the development of the stenosis in this case is quite clear. The ascending pyelitis in the right ureter caused moderate incomplete retention and unilateral dilatation of the pelvis with valve-formation and oblique insertion of the ureter. The inflammation in the pelvis caused the stricture in the upper end of the ureter, a condition which has been so often observed as a complication with valve-formation in infected cases. On account of this condition, further retention and moderate dilatation of the pelvis, or rather of both branches of the ureter, took place. Then followed unilateral dilatation and valve-formation in the lower branch of the ureter which resulted in local cystonephrosis (pyonephrosis) of the lower half or two-thirds of the kidney. During the development of this condition, unilateral dilatation and valve-formation of the necks of three or more calyces took place with absolute occlusion of one calyx.

General Plan of Operating for Cystonephrosis.—(*a*) The general plan of operating for pyonephrosis should first take into consideration the dangers from infection. Thus, opening and drainage of the dilated kidney should first be done to evacuate the pus, and then the pyelitis should be treated locally through the drainage-tube. I always make the nephrotomy from the lumbar region, as Küster advises, because this is so much safer than the transperitoneal operation.

It is ordinarily impossible at this time to find or remedy the obstruction, unless renal calculi are present as the cause of retention. On account of the sepsis, a prolonged search for obstruction of the ureter other than stone cannot be borne by the patient.

(*b*) In cases of hydronephrosis, when the patient's condition will admit of a prolonged operation, it is usually impossible to find the orifice of the ureter in the large sac, and it is impossible to find the ureter outside of or below the sac, because the latter fills the large pelvis and covers the ureter. We must therefore wait for two or three months until the sac has retracted, or, in pyonephrosis, until the septic absorption has disappeared and the sac diminished in size, before further operating for the obstruction can be done.

If the obstructed kidney has still some secreting value, and

if the other kidney is diseased, nephrectomy becomes out of the question. While primary nephrectomy in pyonephrosis, according to Tuffier, has a mortality of 37 per cent., it has been found that in 40 per cent. of the fatal cases death resulted from disease of the other kidney. Although Israel[1] has made a successful nephrectomy on a patient whose other kidney was the seat of pyelitis, we must consider such a case as a rare exception which does not alter the rule not to extirpate a kidney whose fellow is not healthy. In the case just reported I considered nephrectomy absolutely out of the question after the attack of pyelitis and colic in the left kidney.

The importance of extirpation of a piece of kidney tissue during nephrotomy for microscopic examination is well illustrated in Case I. The specimen removed in this case showed large territories of almost perfectly healthy kidney tissue with glomeruli and epithelium in the canals, with only a few islands of disseminated interstitial granulation tissue. It is likely that this nephritis stops during the local treatment of the pyelitis through the lumbar wound, and that what is left of the kidney tissue remains useful.

If some of the urine passes into the bladder we would probably underestimate the secretory value of the kidney if we came to this conclusion from the quantity of urine passed through the fistula alone, and here microscopic examination of the kidney tissue may be valuable.

As soon as the condition of the patient permits, search for the obstruction should be made. I have already discussed the operation for obstruction in the ureter in an earlier paper,[2] and shall detail a case later to illustrate conservative operation in hydronephrosis.

Operation for Obstruction above the Ureter.—Up to this time no systematic operation, planned beforehand, has been made for this condition.

Küster[3] mentions in his paper that he attempts to transform

[1] Israel, Erfahrungen über Nierenchirurgie, Langenbeck's Archiv für klinische Chirurgie, Band XLVI, Heft 2, p. 344, 1894.

[2] Fenger, Operation for valve-formation, loc. cit.

[3] Küster, Loc. cit.

the multilocular into a unilocular sac by breaking down the partition walls with the fingers, or by dividing them with a blunt-pointed knife introduced into the sac, evidently without the aid of the eye. This operation is probably sufficient for those cases of pyonephrosis in which little or no secreting kidney tissue remains and in which obliteration of the sac is the object to be attained.

An entirely different operation, however, is required in those cases where considerable kidney tissue remains, and where the object is to restore to a useful kidney its normal function.

What is the reason that in some cases the obstruction causes dilatation of the pelvis and kidney, terminating in a unilocular sac with little or no traces of calyces, but only flat semilunar bands on the wall, and in other cases a sacculated kidney, with narrow necks or entrances to multiple dilated calyces,—that is, a system of narrow-necked sacs surrounding a moderately dilated pelvis? The cause of this difference is not known, but it seems to me that dilatation of the calyces into sacs with narrow necks is more common in cases of retention with early infection than in cases of retention infected later or not at all (hydronephrosis). The intensity of the infection—the inflammation—is apparently a potent factor. It may be that the inflammation causes thickening of the pelvis and necks of the calyces where the mucosa is provided with a considerable layer of submucous connective tissue, and even with muscular layers capable of inflammatory thickening followed, if not by retraction, at least by resistance against dilatation. The papilla, meanwhile,—that is, the kidney tissue proper, the tissue of the pyramids with thin mucosa and no submucous tissue or muscularis,—does not form a sufficiently thick layer of inflammatory connective tissue to protect against dilatation. If this be correct, it explains the formation of a comparatively small pelvis and of largely dilated calyces, having narrow necks, formed by the papillary portion of the calyx.

An operation to restore the function of a sacculated kidney must have for its object the overcoming of the obstruction in the three places I have already described. Obstruction in the pelvic end of the ureter and in one or more calyces is often found, while the local cystonephrosis is rarely encountered. Occlusion

at the necks of the calyces is probably met with a greater degree of frequency, proportionate to the relation between the number of the calyces and the number of branches of the pelvis.

The operation must begin with bisection of the kidney from its convex surface down to the pelvis. The characteristic features of this operation, which I have termed "operation for sacculated kidney" in contradistinction to nephrotomy, are the treatment of the bisected kidney, the division of all partition walls between the dilated calyces and the finding of all the calyces, some of which may be very difficult to detect.

This operation must be done with full view of, and free access to, the inner surfaces of the bisected kidney. The hæmorrhage varies considerably in proportion to the more or less normal condition of the kidney tissue. Hæmorrhage is controlled by the Paquelin cautery, mass ligatures, or continuous suture along the divided partition walls, together with digital compression of the renal artery by an assistant. It will be impossible to find the calyces, which often have a narrow entrance, to divide all the partition walls, to check the hæmorrhage, to examine the pelvis, and to remedy folds or valve-formation unless we have ready access to the whole interior of the organ with eyes, hands, and instruments.

During the after-treatment I consider it important to have free access to the ureter for the introduction of bougies every day or two when irrigation is made.

Finally, after months of local treatment, when the pyelitis has subsided and the ureter is patent, the bisected kidney should be reunited after the two halves have been loosened from the abdominal wall. Catgut is probably preferable to silk as a suture material in this procedure. When the ureter is patent, when all the calyces have been laid open and the two halves of the kidney have been reunited, the fistula will always close.

Scope of the Operation.—I am well aware that the operation for cystonephrosis proposed by me has a comparatively narrow field in the mass of cases of pyo- or hydronephrosis. It is not intended that it should replace nephrectomy altogether, nor that it should be employed after nephrotomy in all cases. Each of these three operations has its own legitimate field.

(*a*) *Infected Cystonephrosis* (*Pyonephrosis*).—In infected sacculated kidney, primary nephrectomy is rarely indicated, and in this respect I fully agree with Küster; but although nephrotomy, opening, and drainage is the operation of choice, and should be the first operation in the great majority of cases, we may encounter a kidney with multiple abscesses in the kidney substance,—surgical kidney,—in which case primary nephrectomy would be the only means of stopping a sepsis immediately dangerous to life.

(1) *Primary nephrectomy* for pyonephrosis has a mortality as given in the statistics of various observers as follows: Tuffier reports sixty-seven cases, with a mortality of 38 per cent.; Brodeur reports fifty-eight deaths out of 128 cases, a mortality of 46.7 per cent.; von Bergmann reports thirty-two deaths in seventy-three cases, a mortality of 43.9 per cent.; and Israel, in nineteen cases reports a mortality of 21 per cent.

(2) *Secondary nephrectomy*, whether performed early or late, may become an immediate necessity when nephrotomy is followed by persistence or increase of the septic symptoms from additional microbic invasion, leading to the same condition of multiple septic foci in the kidney substance proper.

Tuffier reports twenty-four cases of secondary nephrectomy with two deaths, a mortality of 5.9 per cent.; von Bergmann reports a mortality of 9.3 per cent.; and Israel reports four cases with three deaths, a mortality of 75 per cent. The striking difference in the mortality-rate is undoubtedly due, in part at least, to the fallacy attendant upon statistics from a small number of cases.

(3) *Nephrotomy*.—Franz Ris[1] states that general rules governing the choice between nephrectomy and nephrotomy in pyonephrosis cannot be formulated. It is necessary to individualize. Nephrectomy, he says, is rarely called for, but "nephrotomy in simple (non-tuberculous) pyonephrosis is to be defended also in the cases where the chances for life by extirpation are favorable."

In a large number of cases nephrotomy effects a cure

[1] Ris, Zur Nierenchirurgie; P. Bruns's Beiträge, Band VII, Heft 1, p. 164.

(Küster). The fistula closes, either because the ureter becomes patent from retraction of the sac and spontaneous disappearance of the oblique insertion and valve-formation, or because a sac which has no secretory kidney tissue remaining shrinks and becomes obliterated like a drained abscess. Thus in all cases where nephrotomy is followed by cure,—that is, in which urinary fistula does not persist, further operation is not called for.

The statistics of nephrotomy in pyonephrosis show a mortality in the cases reported by Tuffier of 33 per cent. in calculous, and of 23 per cent. in non-calculous pyonephrosis; von Bergmann reports twenty-two deaths out of seventy-two cases, a mortality of 30.5 per cent.; Küster, one death out of thirteen cases, a mortality of 7.7 per cent.; and Israel two deaths out of thirteen cases, a mortality of 15.4 per cent.

How often further operation is called for, how many permanent fistulas remain, and how many kidneys secrete a sufficient quantity of urine to be of value to the patient I am unable to say, but the statistics of various observers show marked differences in these regards. Tuffier reports 34 per cent. of fistulas in calculous, and 57 per cent. in non-calculous pyonephrosis; S. W. Gross reports 29.5 per cent.; Küster, 9 per cent.; and Israel reports seven cases out of thirteen in which fistula persisted, a percentage of 53.8. The same observer reports two out of thirteen cases cured without fistula, or 15.4 per cent.

(*b*) *Non-Infected Cystonephrosis* (*Hydronephrosis*).—The statistics of primary and secondary nephrectomy and of nephrotomy in hydronephrosis are as follows: Tuffier reports twenty-six cases of nephrectomy with two deaths, a mortality of 7.7 per cent. He reports a mortality of 31 per cent. for primary, and no mortality for secondary nephrectomy. De Jong reports five deaths out of fifteen cases of primary nephrectomy, a mortality of 33.3 per cent.; and S. W. Gross eight deaths out of twenty-one cases, a mortality of 38.1 per cent.

Tuffier reports thirty-two cases of nephrotomy for hydronephrosis, with a mortality of 18 per cent.; Küster had one death in five cases, a mortality of 20 per cent. Tuffier reports 66 per cent. of fistulas, and Küster 40 per cent.

Herczel,[1] in a report from Czerny's clinic, advises, "first, nephrotomy; later, if necessary, secondary nephrectomy."

It is likely, when the above plan is followed,—that is, when primary nephrectomy is made only when sepsis renders the operation imperative,—when secondary nephrectomy in cases of copious urinary fistula is abandoned in favor of the search for and operation for stenosis in the various places in which it occurs, that the cases in which it is possible to save the kidney, which has hitherto been accomplished only when absence of the other kidney made it imperative (Küster's case of resection of the upper end of the ureter and implantation in the pelvis), will be more common than we have hitherto expected, or than can be found in the literature of the past.

I will here give a few examples from the literature of similar cases in which, it seems to me, the kidney might have been saved had this method of procedure been adopted.

Rupprecht[2] reports a case of hydronephrosis in a girl of nine years. The patient had small-pox at the age of three, and the hydronephrosis developed four years later. Nephrotomy was performed by Dr. Meusner. There was a very considerable discharge of urine through the fistula, or, as the author expresses it, she was "flooded with urine all the time." In spite of the fistula and the slowly-increasing albuminuria she felt well for years. Five years after the operation the patient died. The autopsy revealed general amyloid degeneration; the right kidney was embedded in a large cicatricial mass, and was adherent to the colon and liver. There was also cicatricial occlusion of the ureter at the place of its exit from the renal pelvis. This patient's life might have been saved had the operation for valve-formation been performed in time.

Rupprecht also reports the case of a boy of five years, who had a probably congenital, intermittent, right hydronephrosis. Aspiration evacuated boric acid with which the bladder had been washed out. Later aspiration evacuated purulent urine, probably from infection from the bladder. Abdominal nephrectomy was performed. The removed kidney was seventeen centimetres long,

[1] Herczel, P. Bruns, Beiträge zur klinischen Chirurgie, Band VI, Heft 3, p. 494.

[2] Rupprecht, Centralblatt für Gynäkologie, No. 33, 1885, p. 523.

eleven centimetres wide, and four centimetres thick, and weighed 530 grammes. The pelvis contained purulent urine. There was valve-formation and oblique insertion of the ureter, but the obstruction was not complete, as urine would pass down into the bladder upon pressure on the tumor. The patient made a good recovery from the nephrectomy, and felt well for eight months,[1] although cystitis persisted. Sudden uræmic coma and a swelling in the region of the left kidney now appeared, and the patient died two days later. The autopsy showed that the left kidney was not much changed. Three valvular folds of the mucosa of the ureter existed, which divided the ureter into four parts of widely different diameters. Regarding this case, Rupprecht remarks, " Puncture or nephrotomy might perhaps have prolonged life."

I think that nephrotomy of the right kidney and operation on the valve-formations in the ureter might have permitted the patient to bear up, notwithstanding the attack in the left kidney, long enough to permit of nephrotomy and possible operation on the valves in the ureter, which would have saved his life.

Valvular strictures of the ureter at some distance below the pelvis can be extirpated through a longitudinal incision in the ureter. I have done this successfully in a case which will shortly be published.

J. Israel[2] reports the case of a woman of twenty-one years, with intermittent right hydronephrosis, in which the tumor would disappear sometimes spontaneously, sometimes on pressure, as, for instance, during examination. After evacuation, a somewhat enlarged, movable kidney could be felt. The urine at this time was " slightly catarrhal." The intermittent pain was relieved by an elastic bandage with pad. The patient felt better during pregnancy. In the course of ten years as the pain persisted, as the tumor became more immovable, and could not be emptied as completely as before, as hæmaturia and increasing pyuria, increase in size of the tumor and permanent invalidism resulted, Israel decided to remove the kidney by lumbar nephrectomy. This was done and the patient recovered. The kidney " forms

[1] Rupprecht, Centralblatt für Gynäkologie, No. 15, 1888, p. 235.

[2] J. Israel, Op. cit., p. 553.

a large nodular (gebuckelten) sac, in its lower two-thirds the sac-wall is as thin as paper. In the upper third a rather thick layer of kidney substance remains. The pelvis of the kidney is moderately dilated and heart-shaped. In the normal position of the kidney only a small portion of the liquid contents runs off, while the greater portion stagnates in the sacculated and dilated lower portion of the kidney. This is not evacuated until the kidney is turned up into an almost horizontal position with the pelvis directed downward."

This cystonephrosis resembled in every particular the condition in the autopsy and in the case of local cystonephrosis described by me, and it seems probable that early conservative operation—that is, ten years previous—might have saved the kidney.

Rayer, in Plate XV, Fig. 2, illustrates a similar local hydronephrosis of the lower half of the left kidney in a case of nephrolithiasis.

As an instance of conservative operation for aseptic cystonephrosis (hydronephrosis), to prove that when the ureter is made patent the fistula closes or does not form, and, further, to illustrate the series of operations indicated, I report the following case:

Synopsis.—Aseptic remittent cystonephrosis in movable kidney of at least seven months' duration; intermittent hydronephrosis with evacuation of clear urine; pain; lumbar nephrotomy; ureter not to be found; packing, drainage; infection of sac. Two months later retraction of sac one-half; diminution of urine through fistula from five to three ounces daily. One month later, sac considerably diminished in size. Operation for valve-formation and oblique insertion of ureter at pelvic orifice. Closure of wound and fistula in forty days.

CASE II.—Mrs. C. L., aged twenty-eight years, was referred to me by Dr. G. E. Newell, of Burlington, Wis., early in August, 1894. The patient has been married four years, has one child three years of age. She was well until the birth of the child, at which time she was attended by a midwife, had a dry labor, and was much torn. For four weeks thereafter she had more or less severe pain, but at the end of this time had an attack of "inflammation of the bowels" with pain on either side of the pelvis, in the back, and down the thigh. She was in bed two weeks, but has complained more or less ever since.

In February, 1894, she first noticed a movable lump in the left side which descended towards the pelvis when the patient was erect, and was then accompanied by pains in the lumbar region, and slipping back towards the lumbar region when she lay down.

The tumor varies in size, and this variation is associated with urinary secretion. When the tumor is enlarging a relatively small amount of urine is passed, and when it decreases in size there is a very considerable increase in the amount of urine, and the urine is lighter colored and clearer than at other times.

Upon examination the tumor was felt in the left renal region, which, by ballottement, with one hand on the abdomen and the other in the lumbar region, was shown to be movable.

Operation.—On August 8, 1894, I operated in the following manner: I made an oblique lumbar incision, whereupon a lobulated, thin-walled, transparent tumor presented in the wound. Upon incision of the sac wall a quart of clear, straw-colored fluid was evacuated. The inner wall of the sac was then inspected. It was smooth, whitish-gray in color, and resembled a serous membrane, but was more velvety. Five minutes after incision and evacuation thousands of small ecchymoses appeared and oozing commenced from the now blood-red inner surface of the sac.

Upon palpation the finger could not reach either the upper or the lower end of the sac, which was shaped like an hour-glass (see Fig. 3). The lower portion of the sac was round and larger than the fist and its lower end extended down into the large pelvis. I could palpate the wall by pressure from outside of the abdominal wall with one hand in the sac, but could not find the ureteral opening. Upon inspection with direct light, sunlight, no ureter could be seen, and search for the ureteral opening with a probe was also negative. I therefore thought that the ureteral entrance was in the upper portion of the sac.

Between the upper and lower portions of the sac there was an isthmus one and a half to two and a half inches in diameter, circular, and with a sharp edge over which two or three fingers could be passed into the upper portion of the sac, but could not reach the medial or upper end. Through the anterior wall I could feel the spleen moving with respiratory movements. The posterior wall was in close proximity to the vertebral column, the anterior surface of which, with the aorta, I could feel.

The incision opening in the lower portion of the sac was sutured

to the skin, and the remainder of the wound united with buried sutures for the muscles and sutures for the skin. The hydronephrotic cavity was packed with borated gauze and two large drains introduced, one up and one down.

The secretion from the sac gradually decreased until only four or five ounces passed through the fistula in the twenty-four hours, and she was sent to her home for further treatment. The wound was dressed every day.

On October 1, 1894, Dr. Newell sent the patient back to me for examination on account of suspected infection of the sac. Upon inspection of the sac at this time with sunlight, the wall was seen to be rose-red, velvety. The sac was somewhat retracted and could be easily palpated all over its lower portion, but after careful search no ureter could be found. The isthmus was unchanged, I could not reach the upper or medial end of the upper portion of the sac, and a sound passed up for six inches. When two fingers were introduced through the isthmus into the upper portion of the sac, its walls closed upon the fingers with the respiratory movements, and the sac walls came in contact with each other down to the isthmus, while the lower portion of the sac was distended with air.

The question of choice of operation now arose between an operation for reopening of the ureter and nephrectomy. I decided against the latter operation on account of the size of the sac. During the next five weeks the excretion of urine through the fistula diminished to three ounces.

On November 17, I operated to reopen the ureter. Palpation prior to operation showed the sac to be considerably diminished in size. I could palpate all over the surface of the lower portion of the sac, the isthmus, and the upper portion of the sac, the wall of which was smooth (état mamelonné).

I made an incision over the lower portion of the sac, through the old cicatrix and the abdominal muscles. On the anterior and lateral outer wall at the lower end of the sac I found the ureter, which was normal in size. The ureter was now partially isolated with the intention of incising it and through the incision passing a probe up into the sac, and thus determining the pelvic entrance of the ureter. On making traction on the isolated ureter outside of the sac, however, and inspection of the sac, I saw a nipple-shaped projection with a depression in its centre. Through this depression a long flexible silver uterine probe passed into the ureter and down into the bladder

without difficulty. Flexible bougies, Nos. 4, 5, and 6 passed, easily down into the bladder. This demonstrated that there was no stenosis or stricture of the ureter or ureteral opening into the pelvis, but that valve-formation or occlusion by lateral implantation of the ureter on the antero-lateral wall of the lower sac existed.

I now operated on the ureter from within the sac in the following manner: A grooved director was inserted into the ureter and the sac wall and ureter divided for three-quarters of an inch to an inch. The opened ureter was recognized, unfolded, about one centimetre broad, and its wall normal or perhaps a little thinner than normal. The divided sac wall, which was separated from the ureter by loose movable connective tissues, was resected all around, and the borders of the unfolded ureter sutured to the borders of the wall of the sac, thus the free entrance of liquid from the sac into the ureter was positively secured.

The large opening in the sac, two inches in diameter, was now closed by sutures in the outer half of the wall, which did not take in the mucous membrane or the kidney tissue layer in the inner wall of the hydronephrotic sac. Only a small opening the size of a lead-pencil was left for drainage. The adhesions of the opening into the sac were first dissected off from the skin or from the border of the lumbar opening. Gauze was packed along the drainage-tube down to the opening in the sac, the abdominal wall united by buried and skin sutures and the usual dressings applied.

November 18. Much discharge of blood, severe pain, pulse 126, rapid, temperature 101° F., urine thick and muddy, but contains no blood.

November 19. Considerable discharge, consisting of blood with very little urine. No blood in the urine.

December 6. Gradual improvement. The patient has little or no pain. Very little discharge through the drainage-tube, no pus in the sac, some discharge of pus from the extranephritic sinus. On irrigation, when the sac is filled with fluid, pain is felt along the course of the ureter to the bladder. The first urine passed after irrigation contains bubbles of air. A solution of pyoktanin was injected into the sac and the tube plugged. In less than an hour, urine heavily stained with pyoktanin was passed.

December 16. Tube was removed from the kidney and the opening packed with gauze; no pus; very little pain. At times the patient feels a fulness in the right side, but no tumor can be felt. She has soreness in the region of the erector spinæ muscles.

December 19. Since the removal of the tube the discharge has been very slight, at times hardly staining the gauze. On removal of dressings it is usually found that the gauze has been forced out of the wound, and the opening into the sac is made with difficulty. On the introduction of a silver catheter no urine escapes from the sac. Boric acid irrigations were made daily. One ounce of boiled milk was injected into the sac and fifteen minutes later urine of milky whiteness was passed. One hour later urine of the same character was again passed.

December 20. On inserting the catheter, which was difficult on account of the small size of the opening, half a teaspoonful of milky fluid, pus or milk, or a mixture of the two, was evacuated.

December 21. Irrigation stopped. Before operation, when the sac was irrigated, the patient would only notice distention. Since the operation, she has felt, in addition to the distention, pain along the course of the ureter to the bladder.

December 22. The patient has been menstruating for the last twenty-four hours, and complains of pain extending down along the course of the right ureter. There is tenderness on pressure in the right hypochondrium. When the patient lies on the left side a tumor, tender on pressure, can be felt on the right side just below the liver, which can be pushed upward and backward.

December 26. Fistula closed. There has been no passage of air since the irrigations were discontinued. The patient passed twenty-seven ounces of urine containing seventy pus-corpuscles to the field.

The renal fistula closed on the fortieth day after operation.

December 27. Patient passed twenty-six ounces of urine containing no albumen, but a slight cloudy sediment. On microscopic examination fifty pus-corpuscles to the field were seen.

December 29. Patient urinates five to ten times in the twenty-four hours. The urine is acid, and contains no albumen, but pus-corpuscles about ten or twenty in the field.

Remarks.—The ureter ran obliquely on the antero-lateral wall of the sac for an inch and a half. There was no stenosis of the slightly atrophic ureter. The ureteral opening could not be seen or found from the inside of the sac until the ureter below the sac had been laid bare, so that the place of entrance could be seen when traction was made on the ureter.

The sac retracted slightly in the first two months after the nephrotomy, but considerable retraction took place in the third month.

The practicability of lumbar nephrectomy seems to be increased after retraction of the hydronephrotic sac. In this case this could have been done three months after the operation, as the wall of the hydronephrotic sac was only loosely connected with the surrounding tissues or organs.

I think that nephrectomy might have been safely performed in this case, as the urine was normal, and as only about three ounces was secreted in the twenty-four hours from the fistula. I decided, however, to try opening the ureter to see if this procedure would prove efficacious in closing the lumbar urinary fistula.

The case conforms to the law that a lumbar renal fistula does not persist when the ureter is patent. Whether it is worth while to save a kidney with a daily excretion of only three ounces is a question not to be decided until future observations have taught us more about the subject than we know at present,—namely, where to draw the line between a valuable and a valueless organ.

Conclusions.

Conservative surgery in cystonephrosis demands a number of successive operations.

I. *Hydronephrosis.*—(1) Lumbar nephrotomy followed by packing and aseptic drainage. If urinary fistula remains after three months.

(2) Operation for the stenosis,—namely, for (*a*) stricture of ureter, or (*b*) valve-formation and oblique insertion. If the fistula still remains with the ureter patent, which occurs only when there is obstruction above the ureter.

(3) Operation for sacculated kidney as designed by me,—namely, bisection of the kidney and division of the partition walls between sacs. When the entire territory of the sac is thus laid open and the ureter is patent, as demonstrated by free passage of bougies from the kidney to the bladder, and by free passage of injected fluid, then

(4) Closure of the fistula by reunion of the bisected kidney. This last operation may confidently be expected to be followed by disappearance of the fistula. It should not, however, be done until the pyelitis, if present, has been cured by thorough irrigation from the kidney to the bladder. Küster observed a case of nephrotomy in which the fistula closed spontaneously, with patent ureter, but the pyelitis persisted, giving an incomplete cure. I have seen, however, that when we closed the fistula before the pus has disappeared entirely from the urine, the pus in the urine having remained unchanged in amount for a considerable time, that the closure of the fistula acts as a curative measure and causes the pyelitis to cease? is it by exclusion of air or by cessation of irritation of the drainage-tube, the cause of the pyelitis having been removed, as shown in my two cases reported in a former paper.

In unilocular hydronephrosis the operation for bisection of the sacculated kidney is, of course, not required, and only nephrotomy, the operation for valve-formation in the ureter and that for closure of the kidney are needed.

II. *Pyonephrosis.*—(1) Lumbar nephrotomy, followed by drainage and local treatment of the pyelonephritis. When the fistula persists, when considerable healthy urine passes through it, and the kidney has retracted to a reasonable degree,—that is, in two or three months,

(2) Search for the obstruction and operation to remove it.

(*a*) Stricture of ureter and valve-formation at its pelvic entrance. If this condition with a ureter patent from pelvis to bladder, still does not prevent the passage of large quantities of urine through the lumbar fistula, obstruction above the pelvis should be suspected, and

(*b*) Operation for sacculated kidney with bisection and division of the partition walls of the calyces and of the branches of the ureter. When the whole territory of secreting kidney tissue is thus in unimpeded connection with the bladder and still spontaneous closure does not take place, although the pyelitis is almost cured, the final step to effect closure of the fistula should be taken,—namely,

(3) Closure of the bisected kidney, by loosening the adhesions of its two halves to the abdominal wall and by suturing the kidney substance together.

Nephrectomy, like amputation, is a short and summary way to deal with the diseased organ or limb. The loss of a kidney, even if half its function remain, may be more dangerous to life than the loss of an arm or a leg. At the present day we would not think of sacrificing an extremity which might be of even partial use, but kidneys have been sacrificed by hundreds, as is shown by the number of cases of primary nephrectomy in cystonephrosis (pyo- or hydronephrosis). It is impossible to estimate how many of these kidneys might have been saved by conservative operation.

Conservative operation to save a cystonephrotic kidney requires a hard struggle, many operations during a long period of time, and a great deal of energy and patience on the part of both patient and surgeon; but the case above detailed demonstrates that when this course of treatment has to be carried out, because nephrectomy would mean death, a final success can be obtained and the patient be saved from the dangers of, and the social misery attendent upon, an abundantly secreting urinary fistula.

TREATMENT OF INTRAPERITONEAL RUPTURE OF THE URINARY BLADDER.

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TRAUMATIC rupture of the urinary bladder is a somewhat rare accident, and one which, until a few years ago, invariably proved fatal,—in fact, it is only during the last seven years that any successful method of treating it has been adopted. Its occurrence in women is of exceptional rarity, and only one or two cases have been recorded in which any attempt has been made to repair the lesion. The present case, the notes of which are given below, is, as far as I can ascertain, the first recorded one in a woman, in which such an intraperitoneal rupture has been successfully sutured.

J. P., aged twenty-eight years, housewife, was admitted to the General Hospital on August 19, 1895, suffering from abdominal pain and inability to pass water, the result of an accident.

About 10 P.M. the previous evening she was romping with her husband in the sitting-room, when he tripped and fell heavily on her. She was at the time lying on the floor of the room, and he fell across her abdomen. She was immediately seized with intense pain in the lower part of the abdomen, and had a severe attack of vomiting. With the pain she had a great desire to micturate, but found she was unable to do so. A doctor was called in, and urine, darkly stained with blood, drawn off with a soft catheter. The removal of urine by the catheter relieved the straining efforts at micturition, but the abdominal pain extended all over the abdomen, and the vomiting continued all night, at intervals of an hour or so.

Patient had passed water two hours before the accident occurred. She has an infant twelve months old, which she is still nursing. Her catamenia returned a month ago.

She was admitted into the hospital about 10 A.M. On admission she complained of much abdominal pain and an intense desire to micturate. She was not actually sick, but complained of nausea. The abdominal pains were well marked. There was marked tenderness all over the abdomen, but chiefly in the hypogastrium and right iliac fossa. Abdominal respiratory movements absent over its lower half. There was dulness in the left flank, but resonance in the right. The dulness did not alter with change of position. There was much muscular resistance on palpation over the hypogastrium. Temperature 100° F., pulse 84, small. A soft catheter was passed and four ounces of urine drawn off, deeply stained with blood.

At 1 P.M. that day, Mr. Heaton passed a large silver catheter. The instrument could be passed in its entire length without meeting any resistance, and could be felt high up in the abdomen beneath the anterior abdominal wall. No urine escaped until it was withdrawn within three inches of its end, when four ounces of bloody urine escaped.

Mr. Haslam and Mr. Heaton agreed that there was in all probability a large rupture of the urinary bladder into the peritoneal cavity, and an abdominal section was advised without delay.

At 1.45 P.M., that is to say about fifteen hours after the accident, the patient was taken to the operating theatre and anæsthetized with chloroform and ether. The abdomen was opened in the middle line below the umbilicus. On opening the peritoneal cavity a large quantity of deeply blood-stained fluid welled up and escaped. On examining the pelvic organs with the finger a large ragged opening could be felt over the upper surface of the bladder. The incision was enlarged downward and the bladder pulled up into the wound. A jagged rent with torn, everted edges was then seen on its upper and posterior aspect, extending from the summit backward and slightly to the left. It measured three and a half inches in length. Small portions of the everted mucous membrane were cut off and the rent sutured.

The finest Chinese twist silk was used for suturing. The rent was first of all closed by a row of Lembert sutures passed through the serous and muscular coats, about a quarter of an inch from the side of the rent, and issuing on the torn muscular surface. A large num-

ber of these was passed about one-eighth of an inch apart and tied. A second row of sutures was then passed after Lembert's method, passing through the serous and muscular coats on each side of the previous row of sutures. These were also inserted about one-eighth of an inch apart, tied, and cut short. A third row of Lembert sutures were inserted in several places along the rent where the union seemed at all weak. Some twenty or thirty sutures were passed in all.

The bladder was then distended with warm water and found to be quite water-tight. The abdominal cavity was finally flushed with large quantities of boiled water, at a temperature of 110° F., until the water returned quite clean. Sponges were used to render it as dry as possible. The abdominal wound was entirely closed with stout Chinese silk, and no drainage-tube whatever was employed. The wound was dressed with iodoform gauze and absorbent wool, and a No. 11 soft red-rubber catheter left in the urethra.

The patient bore the operation, which lasted one and a half hours, extremely well, and suffered little from shock. She vomited once at 10 P.M. that evening, and again at 3 A.M. the next day, but slept well after having a one-fifth of a grain of morphine subcutaneously.

August 20. Patient slept fairly well after an injection of one-fifth of a grain of morphine. The urine which drained through the catheter was deeply stained with blood. The abdomen was lax, and there was no pain or distention. The bladder was washed out with boracic lotion and several small blood-clots removed. Towards evening she became somewhat restless. Several blood-clots were passed *per urethram*, which forced out the catheter. A second morphine hypodermic was given, after which the patient slept soundly.

August 21. No more sickness. Clots still continued to come away through the catheter. The temperature which had been raised slightly above 100° F. fell to normal, and the pulse to 84. Abdomen soft and painless. The catheter was removed from the urethra, the bladder again irrigated, and the catheter ordered to be passed every three hours.

August 22. General condition better. Began to menstruate. Abdominal wound was dressed and found quite dry. Urine only very slightly blood-stained. At 12.15 P.M. patient vomited after some milk, but otherwise seemed fairly well.

August 23. An olive-oil enema was given without any result. This was followed by a large simple enema, which was also ineffectual.

Diet, milk, and barley-water, mutton-broth, and small quantities of tea and toast.

August 25. A calomel and colocynth pill was given, followed by a saline purge without any action of the bowels. But after a second simple enema they were well opened. The urine contained only a very slight trace of blood.

Her after-history was uneventful. On August 26, 27, 28, and 29 blood again appeared in larger quantities in the urine. The urine at the same time became neutral and extremely foul in odor. This symptom gradually disappeared, and on September 2 there was no trace of blood to be detected in the urine. No power of voluntary micturition returned until September 11, and a catheter was passed every six hours until then. The bladder at times would distend so as to hold as much as twenty-eight ounces, and yet the patient be unable to pass any unaided. A small hæmatoma formed in the sheath of the left rectus muscle, which somewhat delayed the final closing of the abdominal wound, but this was soundly healed on September 20, and she was allowed to get up on September 25, feeling quite strong and well.

She left the hospital on October 3, wearing an abdominal belt to support the operation scar. Micturition was then quite natural, painless, and she could hold her water without trouble, too. She has since remained in perfect health.

The diagnosis of the lesion in this case was an easy matter, but is sometimes one of considerable difficulty. The symptoms of such an accident having taken place are usually as follows:

(1) A history of some form of direct external violence to the hypogastric region when the bladder is distended or moderately full.

(2) Sudden violent burning pain in the lower part of the abdomen accompanied by the signs of shock and collapse.

(3) A constant or almost constant desire to pass water, with complete inability to do so, or with the passage of only a few drops of blood-stained urine.

(4) And if no active treatment be adopted, gradually increasing abdominal distention, with the evidences of free fluid in the peritoneal cavity.

It must be borne in mind, however, that any one of these

symptoms may be absent. The shock of the accident in some of the recorded cases has been very slight. In one of Sir William MacCormac's cases, the patient walked to the hospital after the accident, was examined by the house surgeon, and allowed to leave the hospital again before the lesion was discovered.

At the moment of rupture a sudden burning pain seems to occur invariably, and this as a rule soon extends over the whole abdomen, and may be one of the most marked features of the case. But in other instances, so long as the patient is kept at rest in bed, and urine is occasionally drawn off with a catheter, there is but little if any pain. In this connection it is worthy of remark how little irritating healthy acid urine seems to be to either a raw or serous surface. Wegner has shown by a number of experiments that healthy urine may be injected in large and repeated quantities into the abdominal cavity of rabbits without producing any untoward symptoms, and that it is very quickly reabsorbed.

Cases of ruptured bladder have been recorded in which, at the post-mortem examination, three and a half days, and even five days, after the accident no evidence of peritonitis has been found. The fatal issue in these cases seems to be due to a poisoning of the system by the reabsorption of the excretory products into the blood, through the medium of the peritoneum.

When the rent is a large one, a metal catheter can be passed through the collapsed and torn bladder, and draw off blood-stained urine from the abdominal cavity. Usually the instrument is felt to hitch in its passage against the edges of the tear. The catheter in such cases can be passed its whole length through the meatus, and its point—in the patient—readily felt, free in the abdominal cavity beneath the anterior abdominal wall.

In cases of doubt, the presence or absence of an actual rent may almost always be ascertained by the injection of a measured quantity of some fluid, such as boracic lotion, into the bladder cavity. If the bladder, however, severely bruised, have its walls still intact, it will be seen and felt to rest as a tumor in the hypogastrium, and the whole of the fluid so injected can be

withdrawn again without loss. If, on the contrary, an intraperitoneal rent be present, no such tense bladder tumor will be palpable, nor will it be possible to draw off again all the injected fluid. At the same time the presence of fluid free in the abdominal cavity may be detected in the flanks.

It has been lately suggested by Mr. Walsham,[1] who has reported two successful cases of operation after bladder rupture, that in doubtful cases a small quantity of air should be injected into the bladder. If there be a rent the air will pass into the peritoneal cavity, and give signs of its presence then by the disappearance of the lower dulness. But the injection of even a small quantity in his own case was followed by such alarming symptoms of collapse as to make others hesitate before adopting what would seem to be an excellent and useful means of diagnosis.

If all doubts have not been removed in one of the above ways, an exploratory operation should be undertaken without delay. The anterior surface of the bladder when it is uncovered by peritoneum, should first be exposed and examined. If no extraperitoneal rent be found, the abdominal cavity is then to be opened, and the viscus thoroughly examined from above both by touch and sight. It is only by such method of examination that the presence of a small tear can sometimes be discovered, and the patient will in any case be saved the risks inseparable from a course of treatment based upon an uncertain knowledge of his injury.

Suture of the rent in a torn bladder was suggested by Benjamin Bell, as long ago as 1779, but it was almost a century later before Mr. Willett, of St. Bartholomew's Hospital, in 1876, first actually attempted it. His case was, unfortunately, unsuccessful, and, speaking as lately as 1883, Sir Henry Thomson[2] said that recovery can hardly be regarded as possible.

To Sir William MacCormac is due the credit of having first successfully sutured a torn bladder, and since then the operation has been performed some thirty-seven times.

[1] Transactions of the Medical Chirurgical Society, Vol. LXXVIII.

[2] Holmes's System of Surgery, 1883, Vol. III, p. 234.

Up to this time one of the following methods of treatment had been practised when anything at all was done.

(1) Simple catheterization, sometimes with an attempt to wash out the peritoneal cavity by means of the catheter through the urethra.

(2) Median or lateral cystotomy with drainage.

(3) Aspiration of the abdomen as fluid collected.

A fatal result followed invariably in all cases so treated.

(4) Abdominal section and drainage.

Three successful cases have been recorded in which this mode of treatment was adopted, but one of the cases at least is open to question as to whether it was really one of intra-peritoneal rupture.

(5) The method of treatment, now recognized by all authorities as the only rational one, is that of abdominal section, with suture of the rent in the bladder and cleansing of the peritoneal cavity.

The various steps of the operation itself have already been described in the clinical notes of the case. There are one or two points, however, to which I should wish to call attention.

The operation is a long, tedious, and laborious one. It is therefore of the greatest importance to minimize in every possible way the shock in an already debilitated patient.

A brandy enema may be given before its commencement, and during the whole time the patient should be warmly wrapped up and not unnecessarily exposed. No time should be lost, as is sometimes done, in exposing and opening the peritoneum. When this has been done, considerable difficulty is occasionally experienced in drawing the torn bladder sufficiently into the wound to apply sutures to the rent. In such cases a transverse division of the recti muscles on each side will give considerable additional room.

When the intestines are much distended they occasionally give trouble by prolapsing through the wound and obscuring the view of the bladder. Such a complication is best met by placing the patient in the Trendelenburg position.

Fine carbolized silk is the best material for the sutures.

They should be passed after Lembert's method, one-eighth of an inch apart, through the peritoneal and muscular coats, so as to have a good hold on the bladder wall.[1]

The row of sutures must be passed well beyond the limits of the rent at each end. When leakage has occurred after operation it has almost always taken place from the posterior end of the rent which had been insecurely sutured.

After all the sutures have been passed and tied the bladder should be gently distended with fluid, if the patient's condition will allow it, to see if the organ is water-tight.

The abdomen then to be thoroughly irrigated with boiled water, and rendered as dry as possible by sponging before it is closed.

No drainage-tube is necessary unless peritonitis be already present. In fact, its use seems to be attended with danger. The presence of a foreign body in the pelvis is apt to delay the gluing of the coils of intestine to the injured surface of the bladder, and to interfere with the proper expansion and contraction of the organ.

The after-treatment is that usually adopted after abdominal section. The majority of operators seem to be in favor of having a catheter passed every few hours until voluntary micturition is re-established. But in Sir W. MacCormac's second successful case no instrument was passed after the operation, and the patient passed water naturally. The use of a catheter prevents undue distention of the bladder which is for some days in an extremely atonic state, and a consequent yielding of the cicatrix. But, on the other hand, its continual presence in the bladder or frequent passage is, unless the greatest care and precautions be taken, very liable to produce a troublesome or fatal cystitis.

Abdominal section for intraperitoneal rupture of the bladder has now been performed thirty-seven times, and there have been fifteen recoveries after the operation.

[1] It much facilitates the passage of these sutures if the assistant raise up with the thumb and fingers a longitudinal ridge of peritoneum and muscular coat, which it is then only necessary to transfix. For this suggestion and help I am indebted to my friend, Mr. Haslam, who kindly assisted me.

I have collected together a list of all the successful cases, arranged, as nearly as possible, in the order of their occurrence. In making this table I must acknowledge my indebtedness to Mr. J. W. Walsham's two excellent papers on the subject, published in the *Medico-Chirurgical Society's Transactions*, Vols. LXXI and LXXVIII. It will be seen that the majority of the operators have been English or American surgeons, and, in fact, the accident seems to be one of great rarity on the continent.

TABLE OF CASES OF INTRAPERITONEAL RUPTURE OF THE BLADDER SUCCESSFULLY TREATED BY ABDOMINAL SECTION.

No.	Surgeon.	Age of Patient.	Interval between Accident and Operation.	Condition of Peritoneum and Size of Rupture.	The Sutures used.	Details of After-Treatment.	Reference.
1	MacCormac.	33 years.	19 hours.	No peritonitis; rupture four inches long, median and vertical.	Sixteen silk Lembert sutures.	Peritoneum irrigated and drained; drainage-tube removed fourth day; catheter removed on third day.	Lancet, 1886, II, p. 1118.
2	MacCormac.	37 "	27 "	No peritonitis; large quantity of urine in peritoneal cavity; rent two inches oblique.	Nine silk Lembert sutures.	Peritoneum irrigated; no drainage-tube used; no catheter left in bladder.	Lancet, 1886, II, p. 1119.
3	Hofmokl.	27 "	10 "	No peritonitis; much bloody fluid in peritoneal cavity · rent one and a half centimetres, extended to extra-peritoneal part.	Two rows of silk sutures.	Peritoneum sponged; extraperito-neal wound not closed; catheter left in; urethritis and cystitis set in.	Wien. Presse, 1886, p. 1225.
4	Walsham.	22 "	12 "	No peritonitis; four pints of fluid in peritoneal cavity.	Nine silk sutures.	Peritoneum irrigated; no drainage-tube; catheter left in for two hours, and then passed at intervals.	Trans. Med. Chir. Soc., LXXI, p. 149.
5	Holmes.	24 "	6 "	No peritonitis; tear two inches long.	Eight fine silk su-tures.	Peritoneum washed out; bladder drained through perineum.	Lancet, 1887, II, p. 153.
6	Walter.	22 "	10 "	Peritonitis present; bloody urine in peritoneum; two-inch rent towards base.	No sutures used.	Peritoneum sponged out and drained; catheter left in bladder.	MacCormac's Abd. Section, p. 54, Phila. Med. and Surg. Report'r, 1865.
7	Halstrom.	21 "	21 "	Rent one and a half inches long; no peritonitis present.	Nine Lembert su-tures.	No details given.	
8	Blum.	28 "	40 "	Peritonitis present at operation; much bloody fluid in abdomen; rent size of franc piece.	Ten Lembert su-tures.	Peritoneum irrigated; catheter left in bladder; ten days afterwards attack of cystitis.	Archiv. Gén. de Méd., 1888, II, p. 22.
9	Knight.	49 "	54 "	No peritonitis; ragged rent one and a half inches.	Continuous suture of rent.	Peritoneum irrigated; no drain; catheter left in four days and passed at intervals afterwards.	New Zeal. Med. Journ.
10	Schlange.	34 "	24 "	No peritonitis; rent both intra- and extraperitoneal.	Intraperitoneal wound closed with sutures.	Peritoneum cleansed but not flushed; catheter passed at intervals.	Arch. für klni. Chir., Bd. XLIII, Heft 1.
11	Kerr.	33 "	8 "	No peritonitis; fracture of symphysis pubis; actual rent not seen.	Rent not sutured.	Peritoneum irrigated; recto-vesical space tamponned with gauze; bladder sutured to pelvis in front, and drained.	ANNALS OF SURGERY, 1893, XVIII, p. 647.
12	Rose.	7 "	48 "	No peritonitis; intestines congested; stellate rent.	No sutures used.	Peritoneal cavity flushed and drained; space round bladder packed with gauze; catheter left in bladder.	Deutsche Zeitschrift für Chirurgie, Bd. XXXI, Heft 304.
13	Murphy.	24 "	2 "	No peritonitis; vertical rent from apex to trigone.	Fifteen catgut sutures through the cut edges of bladder.	Peritoneum flushed and drained; catheter in bladder for eight days, and then passed at intervals.	Brit. Med. Journ., 1894, II, p. 979.
14	Walsham.	38 "	25 "	No peritonitis; vertical rent two and a half inches; bloody urine in peri-toneum.	Fourteen Lembert silk sutures.	Peritoneum flushed; no drain; cathe-ter passed at intervals for twenty-four hours.	Brit. Med. Journ., 1895, III, p. 32.
15	Heaton.	Female. 28 years.	15 "	No peritonitis; much blood-stained urine in peritoneum; rent jagged three and a half inches long.	Double row of Lem-bert sutures, twenty to thirty.	Peritoneum flushed and dried; no drainage; catheter left in bladder forty-eight hours and then passed at intervals.	

Of the total thirty-seven cases in which the abdomen was opened, in six cases no suture was employed to the bladder rent. Three of these recovered. In one of these cases no details are given, in the other, that of Kerr, of Washington, the exact rupture could not actually be seen. A tampon of iodoform gauze was placed in the abdomen behind the bladder, and in the third, that of Rose, a similar treatment was adopted.

Of the remaining thirty-one cases in which the rent was sutured twelve cases have been successful and nineteen unsuccessful.

The causes of death in the nineteen unsuccessful cases are interesting as showing the complications which are most likely to ensue.

In five of these cases death ensued from shock, the patient never having rallied from the combined shock of the accident and of the operation. In one case to hæmorrhage, in one to suppression of urine due to old existing kidney mischief, and in one to persistent diarrhœa.

The remaining eleven deaths were due to peritonitis, either already existing or following the operation. In four of the cases it was found, at the post-mortem examination, that leakage had taken place from the bladder, and excited the peritonitis, and in each case the leakage took place at the posterior angle of the wound, where it is always the most difficult to apply the sutures.

In seven cases peritonitis was already present when the operation was undertaken.

It is a noteworthy fact that of the fifteen successful cases in only *two* was peritonitis present when the operation was performed, whilst it was the fatal factor in eleven out of the nineteen fatal cases. This emphasizes better than any words could do the extreme importance of an early diagnosis and the urgency of operation if the case is to be conducted to a successful issue.

RESULTS OF CASTRATION UPON PROSTATIC HYPERTROPHY AS SHOWN IN SIX CASES.[1]

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WHEN the obstruction caused by enlargement of the prostate body has reached a degree which renders the regular frequent use of a catheter impracticable or even difficult, or when there has developed, and persists despite intelligent treatment, such vesical irritability as to create a very frequently recurring demand for catheterization, some method of operative relief is imperative. The removal of the obstructing mass by enucleation after suitable incision for reaching it, either suprapubic or perineal, suggests itself as the natural procedure to be adopted in such cases. According to the statistics of such operations, thus far published,[2] an immediate mortality of about 15 per cent. has attended such attempts. When one considers the hopeless condition for which these operations were performed and the long-continued pre-existing suffering, and the attendant renal complications in many cases, such a mortality-rate is small, and would be of but little weight in determining the justifiability of resorting to prostatectomy in a given case, provided there was no other less dangerous method of relief available. In my own experience, however, the immediate dangers of prostatectomy are much greater than the statistics just referred to indicate. A very condensed statement of my own cases is as follows:

CASE I.—*Perineal Prostatectomy.* February, 1888. Age of patient, sixty-three years. Urination increasingly difficult and pain-

[1] Read before the New York Surgical Society, March 11, 1896.

[2] White, Dennis's System of Surgery, III, 628.

ful for three years; six weeks before coming under my care had been submitted to perineal cystotomy; with closure of wound previous symptoms recurred; when seen by me retention was absolute; he was having constant pain in bladder with frequently recurring violent vesical tenesmus, requiring catheterization every half hour; cystitis extreme. Upon perineal incision as for bilateral lithotomy, the exploring finger discovered general prostatic hypertrophy with excessive overgrowth of right lobe, which crowded urethra over to the left. The projecting portion of the right lobe was grasped by vulsellum forceps and excised; hæmorrhage moderate and easily controlled by packing wound with iodoform gauze after a hard rubber perineal drainage-tube had been placed in the bladder. The patient reacted from the operation in good condition; local wound conditions remained good. On fourth day patient developed slight delirium; day by day thereafter this became more marked, alternating with stupor; a slight diarrhœa developed; the urinary secretion greatly diminished in amount, until on the tenth day after operation he died from uræmia. No autopsy allowed.

CASE II.—*Suprapubic Prostatectomy.* December, 1891. Age of patient sixty years. History of urinary difficulties from prostatic hypertrophy for five years; dependent upon catheter for three years. A calculus had been removed by crushing and evacuation. Renewed symptoms of stone with cystitis gradually developed.

When seen by me, in November, 1891, he was suffering from violent cystitis, with irregular rigors, emaciation, and debility, indicative of septicæmia. December 6, 1891, suprapubic cystotomy was done. After the removal of two moderate-sized calculi the urethral orifice was found to be blocked by a tongue-like projection of the middle lobe of the prostate. This was then excised through the suprapubic wound. The hæmorrhage which followed was quite free but not excessive, and the patient reacted well from the operation, with a pulse of 100, and a normal temperature. The local bladder conditions remained satisfactory, with suprapubic urinary drainage, but the pulse gradually quickened until on the fourth day it had reached 120; by the sixth day a notable general depression was manifest, with semicoma and slight convulsions (uræmic). This condition became progressively more marked, and terminated in death on the eighth day.

The autopsy revealed, in addition to the evidences of chronic cystitis, a large old abscess cavity between the bladder and the rec-

tum, communicating with the rectum. The kidneys were both the subjects of advanced chronic interstitial nephritis.

CASE III.—*Suprapubic Prostatectomy.* June, 1891. Age of patient, sixty years. Dependent upon catheter for removal of urine. Had been subjected to litholapaxy for calculus three months before. Speedy renewal of calculous symptoms with aggravated cystitis caused him to apply for more radical measures of relief. A suprapubic cystotomy was done June 10, 1891, and a small calculus of about a half-inch average diameter removed. Inspection of the bladder revealed the presence of an uvula-like process of the median lobe of the prostate, which as a ball-valve interfered with the escape of urine through the urethra. This was cut away with scissors. The immediate reaction from the operation was good, with little bleeding, but much pain, and some persistent acceleration of pulse, which averaged 110. The temperature remained normal until the fifth day, when it began to rise. By the sixth day the temperature was 100° F., and a condition of general depression and apathy, attended with troublesome hiccough, had developed. Despite treatment, this condition became steadily more pronounced, until it terminated in death on the tenth day after the operation. No autopsy.

CASE IV.—*Suprapubic Prostatectomy.* March, 1892. Age of patient, seventy years. Noticeable difficulty in micturition for two years; dependent upon catheter for some months; occasionally voids a little urine spontaneously, but as a rule can obtain relief only by use of catheter; bladder is contracted; cystitis marked, with pain and tenesmus demanding incessant relief. For four weeks was treated by irrigations and various internal medicaments with but slight benefit. March 14, 1892, was subjected to suprapubic cystotomy. Two small calculi were removed from the bladder. The orifice of the urethra was obstructed by an outgrowth from the median lobe, of no great size, which as a transverse fold was pushed over the orifice of the urethra in efforts at urination so as to block it. A wedge was excised from this so as to remove the obstruction from the urethral orifice. There was a moderate amount of bloody oozing from this cut for a time, but its quantity was never serious. Patient complained bitterly of pain in the bladder, and exhibited mild delirium from the first. The temperature remained normal, but the pulse gradually quickened to 120, with other evidences of increasing general prostration. Despite active treatment, this tendency to collapse increased steadily until it terminated in death on the third day after the operation.

Such a rate of mortality, so greatly in excess of the published experience of others, has not encouraged me to lightly attack the prostate gland in subsequent cases. It is true that the state of each of these patients was already desperate; they were worn out by their sufferings; they were all complicated by calculous deposits, for which, in all but one case, they had been subjected to previous operations; their kidneys were presumably much degenerated; they were most unfavorable subjects for any kind of surgical intervention. Yet their condition demanded an attempt at relief, even if it was but a forlorn hope. Prostatectomy, however, did not even bring to them euthanasia, for the subsequent local pain experienced in each case was extreme. The deaths in these cases seem to me to be attributable largely to renal failure. Without doubt, the previously existing constitutional depression, the effects of the anæsthesia, and the suprapubic section, and the moderate hæmorrhage following the incisions into the prostate, all contributed in some measure to the final unfortunate results, but experience in many other cases of bladder surgery suggests to me that a positive and direct causal relation existed between the intravesical traumatism to the prostate and the subsequent defective renal secretion,—in other words, that had the prostatectomy been refrained from, the kidneys would have continued, for a time at least, to functionate sufficiently well. It is obvious that the post-operative conditions of these cases made impracticable accurate observations as to the quality of the renal secretion, the absorbing pads laid upon the suprapubic opening serving to catch and confound together the bladder and renal discharges. The cases are defective also by the absence of post-mortem examinations. With the exception of the first case the amount of prostatic enlargement was very moderate, and the obstruction was due to the valvular action of a limited fold-like or polypoid intravesical enlargement, requiring but a trifling traumatism for its removal.

Influenced by the results of these cases, in the two following cases I contented myself with simply the formation of a permanent suprapubic fistula.

CASE V.—*Permanent Suprapubic Fistula.* September, 1892. Patient sixty-four years of age. For seven years has suffered from obstructive urinary symptoms, and is now dependent wholly upon catheter for relief. An aggravated chronic cystitis is present. Has become much debilitated by his sufferings. Upon suprapubic cystotomy three medium-sized calculi were removed from the bladder, and a limited polypoid enlargement of the median lobe seen to be the cause of obstruction. This was not interfered with, but permanent suprapubic escape of the urine provided for by suitable apparatus, consisting of Bang's shield, holding through the fistula a soft rubber tube armed with stopcock.

Immediate great relief from local symptoms and temporary general improvement followed this procedure. After a few weeks he dispensed with his drainage apparatus, being able in part to void urine *per urethram;* while part escaped through the suprapubic fistula which remained open. He now passed from under my care, but I have since learned that a gradual recrudescence of his cystitis took place thereafter, with pyelonephritis, ending in death about nine months from the time of the operative effort.

CASE VI.—*Permanent Suprapubic Fistula.* May, 1892. Patient seventy years of age. First came under my notice in January, 1892, at which time he was suffering from retention of urine, distention of bladder, and stillicidium urinæ, due to moderate uniform enlargement of the prostate, with acute congestive swelling. Relief for the time was secured by catheterization. Regular catheterization thereafter was required, with irrigations of the bladder to control the cystitis. For a period of three and a half months this treatment was carried out under the direction of his physician, Dr. S. B. Childs, during which time there were variations of improvement and of relapse, but with gradual increase in difficulty and painfulness of the catheterizations, and in the intensity of the cystitis and bladder tenesmus. Accordingly, May 12, 1892, a suprapubic cystotomy was done for his relief. Examination of the open bladder showed uniform enlargement of the prostate of moderate degree, with diffuse cystitis. No intravesical traumatism was inflicted. Permanent suprapubic drainage secured by the same apparatus as in Case V. For some months he wore this with comparative comfort, and very great relief to his previous sufferings. He would retain his urine in his bladder for periods of from two to four hours, and then void it at will through the suprapubic tube by turning the stopcock. Through

this tube, also, a daily irrigation of his bladder was made. After about ten months of this relief, pain in the bladder and foulness of the urine began to become more and more aggravated, and uncontrollable by suprapubic irrigation. I then added a perineal incision for more complete drainage. This gave some relief to the bladder symptoms, but only to be succeeded by those of nephropyelitis from ascending infection, which finally terminated in death, April 9, 1893, being about eleven months only since the original cystotomy. Post-mortem examination demonstrated the lesions of advanced nephropyelitis, ureteritis, and cystitis. The intensity of the infection of the bladder had resulted in necrosis of its anterior wall over a space as large as a silver half-dollar piece.

The dangers thus demonstrated to attend both intravesical prostatectomy and continuous suprapubic drainage have, in my mind, given added importance to the claims recently made for removal of the testicles as a means of securing atrophy of the prostate, and consequent relief to urinary obstrutcion due to its enlargement, and I have therefore the more readily resorted to castration in such cases of prostatic hypertrophy with urinary obstruction, as had passed beyond that stage of their development in which permanent relief through the usual palliative measures could be expected.

These cases are as follows:

CASE I.—*Double Orchidectomy.* January, 1895. Patient aged seventy-four years. For twenty years has had difficult and frequent urination, but never used catheter. For some months over-distention of bladder with stillicidium urinæ; final complete obstruction for twelve hours, at the end of which time dribbling was again re-established with relief to acute symptoms. This was his condition when first seen by me, January 18, 1895, in consultation with his physician, Dr. Theron Tuttle. Efforts to pass a catheter were unsuccessful. Rectal examination revealed marked uniform enlargement of the prostate. The upper border of the distended bladder reached four inches above the pubes.

The following day, January 19, both testicles were removed. While patient was under the influence of the anæsthetic renewed efforts to introduce a catheter were made, but were ineffectual. Five

days later, the operation-wounds having healed primarily and the bladder being still distended and relieving itself by dribbling, another attempt at catheterization was made, and the catheter passed into the bladder with ease. Thirty-two ounces of urine were evacuated. The use of the catheter at regular intervals of eight hours was instituted, with internal use of strychnine and the local use of faradism to overcome the bladder atony.

May 24, 1895, four months after the orchidectomy, was again examined by me. The prostatic enlargement, as felt by the finger in the rectum, seemed but little if any less than in January. It still projected into the rectum as a hard mass, to the farther edge of which the tip of the index-finger could just reach. He had reduced the interval between the catheterizations to three hours; he was now able to spontaneously void an ounce of urine at a time every hour or two, and by so doing could without discomfort prolong the intervals between the catheterizations to six hours.

January 12, 1896, twelve months after the orchidectomy, again examined by me. The finger in the rectum feels the prostate shrunken to a soft mass about the size of a flattened horse-chestnut; he travels and attends to his affairs without embarrassment as to his urinary functions. He voids urine naturally every two or three hours during the day, and rises once or twice during the night. As a matter of routine, however, he introduces a catheter each night before retiring; the catheter enters easily and painlessly. Introduced by myself, I found the amount of residual urine to be five ounces. There is no cystitis nor pyelitis, and his general health is excellent, being better than for some years.

CASE II.—*Double Orchidectomy.* June, 1895. Patient aged fifty-five years. For eight years has had to urinate with undue frequency; for past five years has had to rise once or twice each night to urinate; for past seven months has been compelled to urinate on an average every hour night and day, with frequent involuntary dribblings of urine in the intervals. June 3, 1895, the over-distended bladder is appreciable as a tumor rising above the pubes half-way to the umbilicus. Rectal examination reveals a moderate pyriform enlargement of the prostate. The length of urethra is shown by catheter to be ten inches. A bicoudée catheter enters the bladder easily, and removes sixty-four ounces of normal urine. Regular eight-hourly catheterization instituted. For a period of six weeks the bladder was regularly emptied by catheter three times daily.

The catheter was used with facility, and there was no overflow in the intervals. The length of the urethra had diminished to nine inches. There was no ability to spontaneously expel any urine. The patient, a gentleman of intelligence and culture, had meanwhile informed himself as to the nature and dangers of prostatic obstruction and the resources available for its management and removal. Being but fifty-five years of age, he had a reasonable expectation of many years yet of life, but his atonic bladder and prostate hypertrophied to the degree of complete urinary obstruction would evidently require the regular use of the catheter during the remainder of his life. The kidneys were yet sound, and no inflammatory conditions of the bladder or ureters had yet arisen. The case was one in which it was eminently proper to urge the value of operative interference, notwithstanding the persistent atony of the bladder due to the previous prolonged over-distention.

He accordingly chose to submit to castration, which was done July 19, 1895. At the end of two weeks the operation-wounds had healed, and the length of the urethra had decreased to seven and a half inches. There was no perceptible difference in the size of the prostate as felt by the finger in the rectum. Was still entirely dependent upon the catheter for emptying his bladder.

At the end of two months, during which he had used the catheter regularly at intervals of eight hours, he reported that after six or seven hours he found himself able to spontaneously expel an ounce or two of urine, but that on introducing a catheter he would find nearly a pint of urine still left in. He was advised to empty his bladder completely by catheter every four hours.

In January, 1896, six months after the castration, he reported that he was still using the catheter every four or six hours; that it passed readily, but that the length of the urethra was then eight and a half inches. He had no cystitis, and no ability to spontaneously void urine until sixteen ounces had accumulated in the bladder, but that he could rid himself of all over that amount. He noted also that there had been as yet no diminution in his sexual powers. He asserts that there has been a noticeable improvement in his mental grasp and intellectual activity since the operation.

March 24, 1896, eight months after the castration, the amount of residual urine has decreased to ten ounces; the size of the prostate as felt by the finger in the rectum has not perceptibly lessened, but its consistence is softer.

CASE III.—*Double Orchidectomy.* July, 1895. Patient aged sixty-eight years. For six years had had frequent and difficult urination. Upon several occasions absolute retention for some time had occurred. For some time had been suffering from vesical tenesmus occurring every few minutes, which would be relieved by passing a few drops of urine after much straining. For the relief of this condition he was admitted into the Methodist Episcopal Hospital July 30, 1895. A catheter was readily introduced into the bladder, and forty-three ounces of urine were removed. The length of the urethra was eight and a half inches. By the rectal touch could be felt a moderate enlargement of the prostate comparable to the size of half a medium-sized apple. On the following day, July 31, castration was done. At the end of one week the length of the urethra had decreased to seven and a quarter inches, and the amount of residual urine to thirty-two ounces. At the end of three weeks, when he left the hospital, his condition remained about the same. He was urinating every two or three hours, and night and morning the bladder was being completely emptied by catheter, removing thirty-two ounces of residual urine each time. Catheterization was facile, and his general condition was greatly improved. His physician, Dr. H. D. Cameron, reports that after his return home the relief from troublesome bladder symptoms continued, a catheter being still used occasionally; after about two months, however, he was attacked by a dysentery, from which after a brief illness he died.

CASE IV.—*Double Orchidectomy.* October, 1895. Patient aged seventy-two years. For three years had been aware of gradually-increasing difficulty in urination, which finally culminated in complete retention. This condition of retention had existed for three days, when he was admitted to the Methodist Episcopal Hospital, October 6, 1895. During this period his bladder had been emptied once by catheter, but when he was received at the hospital his greatly-distended bladder was relieving itself by a constant stillicidium. A catheter was introduced, though with difficulty, and evacuated thirty-seven ounces of urine. The length of the urethra was nine and a half inches. By the rectum a moderate symmetrical enlargement of the prostate could be felt.

Regular eight-hourly catheterization was instituted, and four days later, with the consent of the patient, the testicles were removed.

At the end of one week after the castration it was still necessary to use the catheter, but its introduction had become easy.

At the end of the second week the local condition remained unchanged. The length of the urethra was eight and a half inches. Immediately following the operation a certain childishness and apathy was noticeable. He infected his wounds by disarranging his dressings and picking at the sutures, so that a frank suppuration had developed, for the relief of which open dressings had been instituted. With the advent of the septic wound complication his mental disturbance became more aggravated.

During the third week he began to spontaneously void his urine, and by the twenty-first day he was completely evacuating it, the catheter showing no residual urine, the length of the urethra being eight inches.

From this date no further obstructive symptoms were present. A mild degree of cystitis persisted for a time, for which daily irrigations of the bladder were done.

During the fourth and fifth weeks after the castration he was confined to bed on account of the state of his wounds, due to a slough from the infected cord-stumps. A marked general depression supervened, which was accompanied with mild delirium most of the time. From this he gradually rallied, and at the end of ten weeks, sound healing in the wounds having been present for some time, there was no obstacle to urination, no residual urine, but there was still noticeable some mental weakness, suggestive of senile dementia, aggravated into hallucinations at night. Rectal examination showed the prostate to be soft and diminished to its normal volume, except that the right lobe was still somewhat larger than normal.

January 16, 1896, three months after castration, empties his bladder naturally. There is no residual urine. His mental condition has improved, but all his mental processes are slow, his memory is defective, and there is still a tendency to mild nocturnal delirium. Generally he is feeble, but able to be about during the day. Has become an inmate of a home for aged men.

CASE V.—*Double Orchidectomy*. October, 1895. Patient aged fifty-two years. Was first seen by me in 1890, at which time he had already suffered from noticeably frequent and difficult urination for between two and three years, and had developed some cystitis. Rectal examination then showed a moderate enlargement of the prostate. Catheterization revealed about two ounces of residual urine in the bladder. During the succeeding three years, during which I saw him from time to time, he used a catheter irregularly, and upon two occasions was subjected to confinement in bed at the hos-

pital for periods of two or three weeks while systematic treatment for relief of exacerbations of his cystitis was being carried out. The last of these periods was in August, 1893. Finally, two years later, in October, 1895, he again applied at the hospital for treatment. In this interval he had regularly carried out daily irrigations of his bladder, the introduction of a catheter not being difficult, but the difficulty in spontaneously relieving his bladder had gradually increased until he had become entirely dependent upon the catheter for urination, which condition had then persisted for five months. The bladder had become irritable and contracted so that he was obliged to catheterize himself very frequently, often at hourly intervals night and day, never holding his urine for a longer time than three hours. When admitted to the hospital he was suffering from an exacerbation of his cystitis, accompanied with a right-sided epididymitis. Rectal examination showed that the enlargement of the prostate had increased and that the gland was then apparently the size of a small apple. A catheter passed readily, the length of the urethra being nine and a half inches; a small amount of residual urine was evacuated, but its exact amount was not noted.

October 23, 1895. Both testicles were removed. Regular eight-hourly catheterization and irrigation of bladder continued.

October 29, sixth day after castration, began to urinate voluntarily. Amount of residual urine three ounces.

November 3, eleventh day, the catheter and irrigation are now used but once daily. The cystitis is greatly improved. The amount of residual urine is two ounces. Primary healing of the operation wounds has taken place.

April 27, 1896. Six months after castration reports that his general health and vigor have greatly improved. He still systematically catheterizes himself and washes out his bladder night and morning, removing from three to seven ounces of residual urine each time. In the intervals during the daytime he urinates spontaneously every two or three hours, and during the night rises from two to three times to empty his bladder. A slight degree of cystitis still persists.

CASE VI.—*Double Orchidectomy.* February, 1896. Patient aged sixty-five years. For more than six years had been the subject of gradually-increasing difficulty in urination. Calls to urinate had become frequent night and day, they were attended with much straining, and of late had consumed habitually a half hour or more at each attempt. December 29, 1895, complete retention developed. With much difficulty a catheter was once introduced. Sub-

sequent attempts at catheterization were unsuccessful and bladder was emptied by suprapubic aspiration. December 31, after the third aspiration, he came under my care, the retention being still absolute. Efforts at catheterization were again ineffectual. The catheter was arrested at a point ten inches from the meatus externus. Rectal examination revealed a massive and symmetrical enlargement of the prostate, its apparent size being equal to that of an adult male fist.

Suprapubic cystotomy relieved the retention and exposed to touch and view a large horse-collar shaped intravesical prostatic growth which formed a tumor the size of a lemon. The walls of the bladder were greatly thickened by hypertrophy of the muscular coat.

Continuous suprapubic drainage for nine days was followed by intermittent catheterization through the suprapubic fistula for twenty-five days, at the end of which time, February 3, 1896, being five weeks from date of the cystotomy, the testicles were removed. While under chloroform a soft rubber catheter was introduced easily through the urethra into the bladder and was fastened in place. On the tenth day an attempt was made to substitute for the catheter *à demeure* intermittent four-hourly catheterization, at the end of twenty-four hours, however, after five successful catheterizations, the catheter again would not pass the obstruction, but the patient found that he could urinate spontaneously, the urine escaping in about equal quantities through the urethra and the suprapubic fistula, which had reopened under the pressure.

Spontaneous urination *per urethram* began therefore on the eleventh day after the castration.

February 24, three weeks after castration, urinates spontaneously, *per urethram*, every two or three hours, leakage by the fistula being prevented by finger pressure; has found that, if he waits longer and permits greater distention of the bladder to occur, the urine does not escape so readily by the urethra, but escapes nearly wholly by the fistula despite external pressure upon it. The stream issues with force, but its volume is smaller than normal. General condition excellent. Sound healing of scrotal wound. Rectal examination does not show any perceptible diminution in the size of the prostate.

May 3, 1896, three months after castration, the size of the prostate as felt by the finger in the rectum is not yet appreciably lessened, but he continues to empty his bladder spontaneously and easily every three or four hours; the suprapubic fistula is still patent, and urine escapes through it during efforts to micturate unless finger-pressure is made upon its orifice.

TABULATED SYNOPSIS OF CASES OF CASTRATION FOR PROSTATIC HYPERTROPHY.

No.	Date of Operation.	Age	Bladder.	Amount of Residual Urine.	Introduction of Catheter.	Enlargement of Prostate.	Length of Urethra	Effect of Castration.
1	Jan. 19, 1895.	74	Atony; dilatation; stillicidium; no cystitis; never used catheter.	32 fluid ounces.	Impracticable.	Marked.	(?)	After 5 days easy catheter; after 4 months but little diminution in size of prostate; after 12 months much atrophy; easy urination every 2 to 3 hours; residual urine 5 fluid ounces; general health excellent.
2	July 19, 1895.	55	Atony; dilatation; stillicidium; no cystitis; catheter for 6 weeks.	64 fluid ounces.	Easy.	Moderate.	10 inches.	At the end of 2 months still dependent on catheter; can spontaneously void all over 16 ounces of urine; at end of 8 months expels voluntarily all over ten ounces of urine; catheterization is easy; mental powers markedly benefited since operation
3	July 31, 1895.	68	Atony; dilatation; stillicidium; never used catheter.	43 fluid ounces.	"	"	8½ inches.	After 7 days length of urethra diminished to 7¼ inches; can spontaneously void all over 32 ounces by urinating every 2 or 3 hours; general condition greatly improved; death from other causes two months later.
4	Oct. 10, 1895.	72	Atony; dilatation; stillicidium; never used catheter.	37 fluid ounces.	Difficult.	"	9½ inches.	After 7 days catheterization much more easy; after 14 days length of urethra 8½ inches; wounds infected; mind disturbed, dementia, and delirium; after 21 days completely evacuated bladder spontaneously; no residual urine; after 3 months prostate diminished to nearly normal volume; function of urination normal; mental condition improved; general strength feeble.
5	Oct. 23, 1895.	52	Hypertrophy; contraction; entirely dependent upon catheter for 5 months; catheter used more or less for five years; hourly call for catheter; marked cystitis.	(?)	Easy.	Moderate; size of small apple.	9½ inches	After 6 days began to urinate spontaneously; 3 months after urinates spontaneously every 2 or 3 hours; uses catheter and irrigates bladder night and morning, removing 3 to 7 ounces residual urine each time; great improvement in general health and vigor.

TABULATED SYNOPSIS OF CASES OF CASTRATION FOR PROSTATIC HYPERTROPHY.—*Concluded.*

No.	Date of Operation.	Age.	Bladder.	Amount of Residual Urine.	Introduction of Catheter.	Enlargement of Prostate.	Length of Urethra.	Effect of Castration.
6	Feb. 3, 1896.	65	Hypertrophy; contraction; obstructive symptoms for 6 years; never used catheter; absolute retention; repeated suprapubic aspirations, followed by suprapubic cystotomy and drainage for 35 days.	(?)	Impracticable.	Massive; size of adult male fist; marked horse-collar projection into bladder.	10 inches.	After 10 days began to spontaneously urinate *per urethram;* at end of 21 days urinates freely, but volume of stream is still less than normal; general condition excellent; at end of 3 months normal urination, but little diminution in size of prostate as felt *per rectum.*

From the histories of these six cases, thus detailed, in which orchidectomy for the relief of prostatic hypertrophy was done, it appears that in all of them a permanent improvement to the urinary obstructive symptoms, and in most of them marked betterment of general health, has been secured. In four of them the bladder was in a condition of dilatation with atony of its walls; in two the opposite condition of contraction with hypertrophy of its walls was encountered. In three of them catheterization was impracticable; in another one of them it had already been in use for years, and in spite of it a steady aggravation of obstructive and inflammatory conditions had taken place. In the remaining two cases (Cases II and III) catheterization was not difficult, but in the dilated and atonic condition of the bladder in these particular cases it was evident that unless the obstruction to the outflow of urine should be removed, the patient would be dependent upon the catheter for the emptying of the bladder during the remaining years of his life. In these particular cases operation was not immediately imperative, but was recommended on account of the otherwise great probability of progressive increase in the prostatic enlargement, the possible ultimate diffi-

culty in catheterization and the extreme difficulty in preventing serious infective inflammation of the genito-urinary tract.

In four cases (Cases I, IV, V, and VI) prompt operative relief was imperative, the emergency in one case (Case VI) demanding immediate cystotomy, which was done.

The removal of the testicles was recommended to each of these patients and readily accepted by them in view of the reasonable certainty of the operation being followed by ultimate shrinking of the obstructing gland, and the removal of the hinderance to normal urination. This expectation has been realized in all of them.

In the three cases in which catheterization was impracticable before the operation, it became easy in five and seven days respectively in two of the cases (I and III), while in the third case (VI) the entrance of the catheter was still obstructed at the end of twenty-one days, although the ability to spontaneously void urine had been regained as early as the tenth day.

In all of the cases the power of voluntary urination had been lost; in four of them a system of involuntary overflow, of a few drops at a time every few minutes from the over-distended and paralyzed bladder, had become established. In each of these cases the contractility of the bladder has become in some measure regained, and the power of voluntary urination re-established. In Case IV, at the end of twenty-one days, the bladder had become able to completely empty itself; in Case I, at the end of twelve months, the bladder is able to expel all over five ounces; in Case II, at the end of eight months, ten ounces of urine have to accumulate before any power of voluntary expulsion is perceptible; in Case III, at the end of one week, only the excess beyond thirty-two ounces could be voluntarily expelled, but the stillicidium had been relieved, and by urinating not oftener than once in two or three hours, he was free from discomfort. It is stated by his physician, Dr. H. D. Cameron, that further improvement in the bladder conditions of this patient followed later, but his death from other causes, at the end of two months, prevented the securing of any exact data by personal examination.

In the two cases in which contraction of the bladder with mural hypertrophy existed, but with absolute obstruction to the exit of urine, the ability to void urine normally was regained at the end of six and ten days respectively after castration (Cases V and VI).

As to the effects of the operation other than upon the prostate, there was no disagreeable result, either local or general, except in Case IV, in which the operation was immediately followed by some mental disturbance which later, coincident with an infection of the wound leading to considerable suppuration and some sloughing, developed into temporary dementia and mild delirium. With this was associated an alarming general prostration. With the clearing up of the local infection, the general condition improved, but at the end of three months, when the last observation was made, it was quite evident that the man still displayed a general feebleness and mental childishness, greater than had been present before he was subjected to operation. It is not at all clear, however, that his condition would not have been worse if no or some other operation had been done. In all the other cases a very marked improvement in the general health has followed, attributable, doubtless, to the disappearance or amelioration of the obstructive and inflammatory disturbances of the urinary function.

The shrinking of the prostate and the consequent relief to the obstruction caused by its overgrowth, which has been observed after castration in these cases of my own, corroborate the claims made by White as to the value of castration as a therapeutic procedure in cases of prostatic hypertrophy with obstruction. That all the elements of the prostate ultimately become affected by the regressive process is well illustrated in my first case, in which there was present a hard and firm prostate, which for more than twenty years had been the cause of noticeable obstruction. The fibrous elements evidently predominated in the hypertrophy present. Although the obstructive symptoms were noticeably and permanently relieved within one week after the castration, owing probably to atrophic changes in the glandular elements, yet at the end of four months the size of

the prostate, as felt by the finger in the rectum, had apparently diminished but little if any. Nevertheless, eight months later, being twelve months after the castration, a very marked atrophy of the whole organ had taken place.

It has not seemed to me that there exists any good ground for hesitation in resorting to castration in cases of prostatic hypertrophy on account of fear of possible mental and moral degeneration to follow the loss of the testes.

Comparative pathology suggests no serious changes of the kind. It is true that the gelding, the ox, the castrated dog and cat lose the element of fierce sexual aggressiveness from their character, and a greater docility of disposition and sluggishness of action develop. But their intelligence and capability for productive work is not diminished.

Post-operative mania has undoubtedly resulted from castration in exceptional cases. I have reported in another connection a fatal case of the kind which followed the removal of both testes for disease of their own substance. The patient, an old man, was highly neurotic and much worn with long-continued pain. In the series of cases now reported of castration for prostatic hypertrophy, in one instance, Case IV, marked mental disturbance developed after operation, but it was much aggravated by the infection of the wound which had occurred, was most intense while the septic disturbance was at its height, and subsided as the local conditions improved. I doubt, however, whether a similar suppuration and slough in another part of the body would have caused the same mental phenomena, and think that it is more reasonable to attribute the dementia and delirium to the combined effect of the loss of the testes and the septic irritation of the stumps of the spermatic cord.

The remote possibility of the development of mania after castration, while it is not to be ignored, cannot be given much weight as a contra-indication to the operation in the presence of the marked obstructive symptoms for the relief of which the castration is considered.

The strength of any sentimental objection to the removal of the testes, which may be felt by the individuals more particularly

concerned, will be greatly influenced by the manner in which the subject of castration is handled by the surgeon himself. I have not found that the idea of loss of the testes and the possible deprivation of future sexual pleasures causes much concern to men who cannot pass their urine, provided they can be assured that thereby in all probability a speedy removal of the obstruction to urination will be secured.

FURTHER EXPERIENCE IN THE EFFECT OF THE SIMULTANEOUS LIGATION OF BOTH INTERNAL ILIAC ARTERIES FOR HYPERTROPHY OF THE PROSTATE GLAND.[1]

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FOR many years the subject of the radical cure of hypertrophy of the prostate has been under discussion, and that with good reason. The troublesome retention of urine, resulting in almost every instance, sooner or later requires relief. When the patient has become tired of using the catheter or unable to enter the bladder with the same the surgeon will be called upon to bring help. He now can try to treat the trouble symptomatically or he can strive for a radical cure. In other words, he either will establish permanent drainage, in order to eliminate the worst symptom, "retention," and thus improve or even cure other dependent symptoms, or he will perform an operation with the outspoken purpose to reduce the size of the prostate gland, and thus remove the obstacle to the outflow of urine at the neck of the bladder. Suprapubic drainage has been wonderfully improved lately. The method of Witzel, who establishes an oblique canal through the wall of the bladder by burying the

[1] Read before the Section on Genito-Urinary Surgery of the New York Academy of Medicine, December 11, 1894. The publication of this article has been purposely delayed. The author wanted to gather, if possible, some more personal experience with reference to the value of the operation in question. As no suitable cases, however, were encountered, in which this mode of procedure was applicable, the article is now published as read fifteen months ago.

tube in the latter by an ingenious mode of stitching, makes a water-tight fistula from the beginning.[1] Prolonged suprapubic drainage will, however, only very exceptionally influence the size of the hypertrophied prostate gland. In almost every instance the patient has to wear the permanent catheter for the remaining part of his life. If he fails to be clean, when changing the tube, he will infect or reinfect his bladder and often also the generally dilated ureters, also the pelvis of the kidneys, etc.

Therefore, if there be a way of reducing the size of the hypertrophied prostate and therewith re-establishing the normal outflow from the bladder, this way should be proposed after careful consideration of the given case.

That this is feasible by surgical interference only is self understood.[2]

Multiple are the operations proposed for attacking the swollen prostate.

Omitting consideration of prolonged drainage of the bladder with a very large tube through the median incision, with or without prostatotomy and overstretching of the prostatic urethra, a treatment which, in my estimation, can produce a passing favorable effect only, we can divide the operations devised for the purpose into two classes.

(1) Those in which the operation attacks the gland directly.

(*a*) Through the urethra.

A groove is burned into the gland with the help of a galvano-cautery porcelain burner (Bottini).

(*b*) By the sacral route, so-called, lateral prostatectomy (Von Dittel).

[1] The operation was originally devised and performed for making a gastric fistula, Centralblatt für Chirurgie, 1891, p. 601. See also Willy Meyer, "Recent Methods of Gastrostomy for Stricture of the Œsophagus," American Journal of the Medical Sciences, October, 1894.

[2] Lately, English, of Vienna, studied the influence of the internal use of prostate-tablets (made from the gland of bullocks) on the hypertrophied prostate in nine patients (Wiener klinische Wochenschrift, 1896, No. 4, p. 66). The results have not yet been striking: treatment is continued. So far he saw less frequency of micturition, especially during daytime; smaller amount of sediment and albumen in the urine; less trouble in emptying the bladder. English, therefore, proposes to try this palliative treatment in patients who have yet little trouble and no residual urine.

(*c*) Through the suprapubic incision.

The gland, especially its middle lobe, is nipped away piecemeal with the rongeur forceps, or a wedge is cut out with scissors, or it is destroyed with Paquelin's cautery or the galvanocautery.

I omit perineal prostatectomy after the median incision, no doubt a most uncertain operation.

(2) Those operations in which we try to reduce the blood-supply of the swollen organ, and by that means cause atrophy. This can be done—

(*a*) Indirectly, by removing the testicles (Lannois, Ramon, Haynes, White).[1] This explanation of the curative influence of castration upon the swollen prostate gland—namely, the permanent removal of "the frequent, intermittent, active hyperæmia of the genital system, which is produced by the presence and secretion of the testicles by nervous reflex"—seems to me the most plausible one. I have mentioned it before.[2]

(*b*) Directly, by ligating the arteries which feed the prostate, —that is to say, simultaneous ligation of both internal iliac arteries (Bier's operation).[3]

It is this latter procedure which I am going briefly to consider in this communication from personal experience.

I take it for granted that the members of the section are acquainted with Bier's original article on this procedure, also, probably, with a brief article of mine which deals with the same subject, and appeared in the July issue of the ANNALS OF SURGERY, 1894.

On April 8, this year, I presented to the New York Surgical Society my first patient on whom I had performed the operation under discussion.

[1] Since December, 1894, the following substitutes have been proposed for this operation: unilateral orchidectomy, double ligature, and division, evulsion, subcutaneous incision of the vas deferens.

[2] ANNALS OF SURGERY, 1894, Vol. XX, p. 50.

[3] I was astonished, when reading Dr. White's thorough and most valuable article, "The Results of Double Castration in Hypertrophy of the Prostate," ANNALS OF SURGERY, July, 1895, to find, in his compilation of the various procedures of surgical treatment of the hypertrophied prostate up to 1895 (pp. 33–35), Bier's operation not even mentioned.

CASE I.—Man, aged fifty-five years, very fat, syphilitic, repeated gonorrhœic infections; absolute retention for six months; severe purulent catarrh and atony of the bladder; bilateral pyelitis. Operation October 5, 1893.

Left side; patient on his back. Incision five to six inches long, slightly convex outwardly from a point about two fingers below the tip of the eleventh rib to a point corresponding to the junction of the middle and outer third of Poupart's ligament. Internal iliac artery easily reached.

It was difficult, however, to expose it conveniently for splitting its sheath. The latter was done with a curved scalpel, which had been handed and used by mistake. Hæmorrhage, when surrounding the vessel with the aneurism needle. Division of the artery. Repeated trials securely to ligate the proximal cut end of the artery, and thus check a stubborn hæmorrhage coming from the same, failed. Clamp put on and left in place for safety's sake on proximal *and* distal end of the artery. Partial closure of wound at both ends by buried catgut sutures, layer by layer. Loose tamponnade around forceps.

For the operation on the right side, patient was transferred upon a table permitting of Trendelenburg's posture. Incision down to the peritoneum, the patient being in horizontal position. When dividing the transversalis fascia the tightly-adherent very thin peritoneum is injured in two spots. The very small wounds are sewed up at once. The wound having been sufficiently deepened to the parietal peritoneum in its entire length, the pelvis of the patient was raised to an angle of about seventy degrees. Access to the vessels thereby greatly facilitated. Yet, on account of the direct descent of the internal iliac into the true pelvis, after its branching off from the common in this case, the two ligatures could not be placed in proper distance in order to divide the artery between them. Two stout catgut threads were therefore tied around the internal iliac artery about one inch apart, trusting to the occlusion of the vessel by thrombus. No division of the artery. Wound closed entirely without drainage, stitching layer by layer. Primary union of wound on right side. Clamps removed on left side on the fifth day. On the twelfth day after the operation secondary arterial hæmorrhage. This came, as it was found at the subsequent operation, from a necrosed spot in the anterior wall of the *external* iliac artery caused by pressure of the forceps, which, as stated, had to be left in place. Ligating of the common iliac artery with silk close to the aorta, catgut having cut

the arterial wall repeatedly, and of the distal end of the external iliac artery with catgut. Loose tamponnade of the large wound. The ligature of the common iliac caused gangrene of the toes and a part of the metatarsus, which latter necessitated partial amputation of the forefoot. The large wound in the groin healed slowly by granulation.

(*a*) "Result of the operation," as far as the size of the prostate is concerned.

Six months after the operation the prostate on rectal palpation is almost normal in size. The length of the urethra, which was twenty-three and a half centimetres before the operation, has been reduced to twenty-one and a half centimetres.

(*b*) Functional result of the operation with reference to micturition.

Twelve hours after the operation the patient began to pass urine, two ounces, in a very fine stream, voluntarily, for the first time within six months. During the following fifteen days he frequently voided small quantities through the urethra, but also had to be catheterized. Eighteen days after the operation he commenced to pass larger amounts at a time with a satisfactory stream; largest quantities on October 25, —550 cubic centimetres. He urinated every one to two hours. On October 26, three and a half weeks after the operation, 130 cubic centimetres having just been voided, the catheter withdrew 730 cubic centimetres of residual urine. Two days later 225 cubic centimetres were voluntarily passed at 1 A.M., 110 at 3 A.M., and at 5 A.M. the catheter withdrew a full quart of water. The muscular power of the bladder evidently was greatly reduced (atony). Yet continuous retention did never set in again, after the operation had been performed. As soon as the foot had healed, and the patient began to walk about, he regained better power over the bladder. On April 28, when leaving the hospital, patient was able to hold his urine two to four hours, and then pass ten to twelve ounces in a forcible stream. Still the bladder, when tested, always showed a residual urine of 300 to 750 cubic centimetres. I am convinced that atony was the only cause of the patient's inability to completely empty the viscus.

Three months ago the patient, who resides in the South, returned to New York and to the German Hospital. A wound on the outer side of his foot, firmly healed after he had left the city five months ago, had reopened. He had not used the catheter so far. He voided the urine about every two hours during the day and three to four

times during the night. The rest at the hospital acted unfavorably. The frequency of micturition increased, the quantity passed each time correspondingly decreased; retention again set in, when with slowly rising temperature an abscess formed in the left hypogastric region, caused by the silk ligature around the common iliac. The ligature was discharged with a large amount of pus. The wound is now, December 6, almost healed: prostate only very slightly enlarged. There is no doubt in my mind that the complications in this case have materially marred the result of the operation, especially detrimental to a proper contraction of the atonic bladder wall must have been the suppuration in the retroperitoneal space; the abscess at its lower end presented a regular purulent pericystitis.

Case II.—Man, aged sixty-three years; uneducated, deaf, very anæmic; hypertrophied prostate; absolute retention for three months as far as it could be ascertained. At time of admission bladder reaches the umbilicus. Mercier's elastic catheter refuses to enter the bladder. I succeeded with Trendelenburg's prostatic catheter sound, modified by myself. A slight hæmorrhage and some rise of temperature followed.

In view of the difficult catheterization and the social condition of the patient—he lived alone with his aged wife—I deemed it best not to establish a suprapubic fistula. Could I have had the chance to properly explain the pros and cons of the contemplated operation to the patient and his wife, I believe castration would have been my choice in this case. But under the circumstances the medico-legal aspect of this interference prevented me from doing so.

I therefore resorted to Bier's operation. On May 21, 1894, patient being in a slight Trendelenburg's posture of about 30 degrees, I cut down to the parietal peritoneum under aseptic precautions. It was apparent to everybody present how easily the peritoneum could be stripped from the transversalis fascia in this posture as soon as the latter had been incised by a small cut. Air was at once aspirated into the properitoneal space. Although there was not a particle of properitoneal fat, the finger of the left hand could be gently pushed forward under the fascia and the latter then divided on the same. I think this point of putting the patient into Trendelenburg's posture of about 30 degrees, when dividing the abdominal layers, is of importance. It certainly saves time and guards against injuring the peritoneum. If properly adhered to and carried out, it will prove of benefit in all operations where we have to enter the retroperitoneal space. As soon

as the peritoneum was exposed the pelvis was raised to an angle of about 75 degrees. Now all the retroperitoneal tissues, even those of the true pelvis, were easily accessible to my hands and eyes. The large vessels were not atheromatous as far as could be felt, but soft and elastic. As proposed in my former article,[1] I did not open the sheath for a greater distance in order to divide the artery between two catgut ligatures. I used silk and tied the artery only once after having opened its sheath. Not a drop of blood was lost during these manipulations. Sponging was not needed. The pelvis then was again lowered to the original angle (30 degrees), and the peritoneum allowed to drop back in its place. The wound was closed with catgut (continuous suture) layer by layer. Dressing with iodoform gauze and collodium. The same operation was at once done on the other side with equal satisfaction. There was not the slightest shock afterwards. Time of operation just one hour. Healing of the wounds ideal. No rise of temperature. On account of patient's deafness all inquiries must be made in writing. This made the after-treatment very annoying. On the third day after the operation the patient began to develop subnormal temperature without any apparent cause. This phenomenon increased in spite of suitable treatment. Patient died in a comatose condition seven days after the operation.

A very limited autopsy only was permitted. Primary union of the wounds; the internal iliac arteries did not show arterial sclerosis. However, one common showed an atheromatous, macroscopical deposit. Silk ligatures aseptically healed in place. On the one side no thrombus whatever in the artery on either side of the ligature. In the other one a thrombus three-quarters of an inch to an inch in length had formed in the afferent and efferent part of the vessel. It was adherent to the wall; it did not reach up to the bifurcation of the common.

Functional Result.—Patient voided his urine in a fine stream a number of times during the night following operation, also on the following days. Retention did not set in again.

CASE III.—Man, aged sixty-five years; syphilitic; prostate uniformly enlarged; its upper edge can be reached by rectal palpation; length of urethra, twenty-two and a half centimetres; retention for two weeks.

July 19, Bier's operation in the posture as described above.

[1] Loc. cit., p. 49.

Right Side.—The large vessels having been exposed, it was seen that the common and external iliac arteries were slightly atheromatous but pulsating. The internal iliac artery, of the size of an ordinary lead-pencil, appeared to be in a state of pronounced arterio-sclerosis. Its pulse could not be seen nor could it be felt. The silk ligature, after having been thrown around the vessel, did not break the calcareous shell of the latter's wall in spite of my steady, strong pull. Having my former experience, the hæmorrhage, in mind, I now, I fully confess it, did not venture to force my way through. The vessels thus remained untied. The ligature was left in place and the wound hermetically sealed.

Left Side.—Exactly the same condition; common and external iliac artery pulsating; internal iliac presenting a cord, which did not change its calibre whatsoever. In order not to have done the work entirely in vain, I this time ventured to pull on the silk ligature with sudden short jerks. To my delight the hard adventitia gave way; the artery was successfully tied. Hæmorrhage did not set in. Suture and dressing of the wound as usual.

I regret to-day that after this experience I did not at once reopen the wound on the right side and perform the same manœuvre in tying the vessel. The operation would then undoubtedly have been successful on both sides, and the patient most probably better off than he is to-day. As it were, only the left internal iliac was tied.

I wish to emphasize here that the internal iliac arteries were by no means thrombosed. This was shown by the ligature on the left side, which deeply constricted the vessel. There merely was such an exceptionally marked arterio-sclerosis that the pulse as such had ceased. The calcareous shell in its tight grasp around the vessel was stronger than the heart's action of the patient. Time of operation fifty-five minutes. The wounds healed kindly without the slightest reaction. Patient was up and about on the fourteenth day after the operation.

The functional result of the operation, however, was *nil.* Regular catheterization was required. When after four weeks no improvement with reference to micturition had taken place, I gave in to the patient's earnest demands, and established a suprapubic fistula according to Witzel's method. It proved to be water-tight from the beginning, and functionates very satisfactorily up to date. Patient removes the stopper on catheter every three or four hours and empties

the viscus. Since the end of September a small quantity of urine can be voided through the urethra. On October 29 he passed in my presence twenty-five cubic centimetres through the normal channel and per catheter 125 cubic centimetres. (Proportion = 1 : 5.)[1]

But what appears to be, in spite of the functional failure of the operation, of the greatest interest and, I believe, of importance, is the fact that on rectal examination the left lobe of the prostate is almost one-third the size of the right one. On the left side the internal iliac artery had been successfully ligated. This phenomenon—the decrease in size—was already well marked four weeks after the first operation; it is still more pronounced to-day. It proves that the ligation of the internal iliac artery really caused atrophy of the respective side of the prostate gland. Under the 9th of December he writes me from a town in Pennsylvania, where he lives, that he now passes "very much water through the penis."

In reviewing the many questions which present themselves as a matter of fact, on considering this new and fascinating operation, I shall pick out a few only, trusting that the discussion may bring out yet others.

(1) Does simultaneous ligation of both internal iliac arteries deserve a place among the operations for the radical cure of the hypertrophied prostate gland?

The result of my three cases, just related, with reference to the radical cure of the trouble, I fully admit, is far from being brilliant. One patient was only partially improved; one died of unknown cause, just seven days after the operation; the third has not been improved at all. However, in order to be just, it should not be forgotten that the first case was a complicated one from the beginning, the secondary hæmorrhage, the long confinement to bed on account of the nutritive changes in the foot following ligation of the common iliac, recurring within the last weeks, the formation of the retroperitoneal abscess due to the fact that the

[1] October 29: the vesical fistula is absolutely water-tight. Now nine ounces can be filled into the bladder, the patient standing, and not a drop escapes along-side the catheter. The bladder when being stretched to this extent empties itself through the urethra at short intervals. Two ounces can be held in the bladder when the catheter is removed and there is no leakage from the fistula. If more water be poured in it runs out.

silk ligature had to be left behind in the depth of a suppurating wound, all these annoying accidents naturally must interfere with the functional result. Yet I believe that after a while it will be found that the operation has not been done in vain. If in this case somebody wants to find fault, it should be with the operator, but not with the method. Whether in my second patient the operation was the immediate cause of death I should not venture to decide. I for my part believe it was not. Perhaps the narcosis or the catheterization before the operations had more to do with the fatal issue than the operation itself.

In my third case the artery was successfully tied on one side only. However, the case is of the greatest importance for properly estimating the value of the operation. There had been a uniform enlargement of the entire gland before the operation. Four weeks later a marked palpable atrophy of the left lateral lobe has taken place already, whereas the right of course still presented its original size. This phenomenon becomes gradually more pronounced. This fact gives, in my estimation, the ligation of the internal iliac artery its firm place among the radical operations for the relief of this trouble. It also proves that even in marked arterio-sclerosis of the respective vessels, ligature is feasible and effective. It will be of weight to add here that in two of Bier's cases a very marked decrease in the size of the prostate could be demonstrated a couple of weeks after the operation.

(2) Can we apprehend that the reduction in the size of the gland will be permanent?

I would answer, unhesitatingly, "Yes." The two internal iliac arteries alone feed the gland. There are, of course, capillary anastomoses with other arteries, so as to prevent gangrene of the respective parts. But this communication with other arteries through the capillary system will never throw such an amount of blood into the gland as to cause again swelling of the meanwhile atrophied organ. To a doubtful mind further observation of cases thus operated upon has to prove this assumption.

(3) Is the operation a difficult and serious one?

Answer.—The operation is not at all a difficult one if per-

formed in the various angles of Trendelenburg's posture, as described above. It can be well performed on both sides inside of one hour. If we use silk instead of catgut, one ligature will suffice to a permanent occlusion of the vessel. The artery need not be cut between the two ligatures. Secondary hæmorrhage is thus excluded. If left in an aseptic field, the silk ligature, being aseptic itself, will no doubt be encapsulated, without giving rise to an abscess in the future. The wound should never be drained but closed entirely by buried sutures, continuous stitching layer by layer. In order to facilitate this part of the operation, I found it of advantage to make the wound slightly funnel-shaped, the two ends of the incisions in the different layers of the abdominal wall can then be well seen. By thus sealing the wound, a ventral hernia will be avoided.

(4) Shall the operation be an extraperitoneal or a transperitoneal one?

I should decidedly answer, "Extraperitoneal," in spite of doubling the incision. It must be remembered that in almost all the cases which will, perhaps, be subjected to this kind of operation, we have to deal with older, often very stout, subjects with fatty degeneration of the heart, etc., who bear intraperitoneal interference not as well as younger persons.

(5) In which cases is the operation advisable?

I believe the operation is indicated in all cases of hypertrophy of the prostate where absolute retention is of recent date and marked dilatation with atony of the bladder has not yet set in, and where we seem to be justified to strive for a radical cure. In such cases the operation certainly stands the comparison with biting away or cutting out portions of the prostate after suprapubic incision, for it leaves the parts in their normal anatomical relation and removes the obstruction at the neck of the bladder in the simplest way, by producing progressive atrophy of the organ which causes the obstruction. It also keeps the generally older patients in bed for only ten or fourteen days, the wounds healing by primary union under the first dressing. The wounds which open bladder or urethra for attempting a radical cure of the hypertrophied prostate do *not* heal *per primam*, and keep the

patients in bed for a number of weeks. Hypostatic pneumonia is the threatening foe.

In view of the brilliant functional results after castration, also after resection or division of the vas deferens, I should say to-day (time of publication), "Bier's operation seems to be indicated only in patients below the fiftieth to sixtieth year with absolute retention of urine due to the hypertrophied prostate, who are tired of catheter-life, but who refuse to lose one or both testicles, and also are unwilling to become sterile, in spite of the probability of an otherwise undisturbed power of sexual intercourse." The surgeon may well, at times, be confronted with such a case.

If a patient with hypertrophy of the prostate is satisfied to have his testicles removed, or, if not that, to wear the catheter in a suprapubic, though water-tight, fistula for the remainder of his life, I should, of course, not persuade him to have Bier's operation done on him, so much the more not as there are, on account of the relative youth of the operation, no observations yet at our disposal which prove that the atrophy will be a permanent one.

In conclusion, I should say that the operation seems to me to fully deserve a fair trial by surgeons in general.

RESULTS AND METHODS OF SURGICAL OPERATIONS AT THE NEW YORK HOSPITAL FROM AUGUST 1, 1895, TO JANUARY 31, 1896, AND AT THE HOUSE OF RELIEF FROM AUGUST 1, 1895, TO MARCH 10, 1896.[1]

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IN the following list have been included only those operations in which there was some risk to life, and those in which the avoidance of suppuration was almost essential to success.

Laparotomies.

(1) *For Diseases of Tubes and Ovaries.*

	Cases.	Recoveries.	Deaths.	
			Due to Operation.	Wholly or Mainly Independent of Operation.
Salpingitis	23	23		
Ovarian cysts and tumors	5	5		
Ectopic gestation	4	3		1
Total	32	31	0	1

The total number of cases treated during the period extending from August 1, 1895, to January 31, 1896, in my division at the New York Hospital was 1080. At the House of Relief during the same period, and on to March 10, 1896, 124 cases, probably 95 of them surgical, were taken into the wards,

[1] Read before the New York Surgical Society, March 25, 1896.

and furnished 37 operations included in this list. I cannot conveniently give the number of operations of all kinds, for no special record is kept of them; the number included in these statistics, counting therein 30 compound fractures, is 228.

(2) *Abdominal Hysterectomies.*

	Cases.	Recoveries.	Deaths.	
			Due to Operation.	Wholly or Mainly Independent of Operation.
Fibroid of uterus	7	5	1	1
Cancer of uterus	4	2	1	1
Ectopic gestation	1	1		
Total	12	8	2	2

(3) *Other Laparotomies.*

Ovariotomy for fibroid uterus	1	1		
Pedunculated fibroid	1	1		
Tubercular peritonitis	1	1		
Generalized sarcoma	1	1		
Ventral hernia after laparotomy	1	1		
Hysteropexy	1	1		
Total	6	6	0	0

(4) *For Disease or Wound of Intestines.*

Cancer of cæcum, excision	1	....	1	
Gunshot wound	1	....	....	1
Stab-wound	1	1		
Appendicitis	20	19	....	1
Total	23	20	1	2
Grand total	73	65	3	5

The death following the operation for ectopic gestation in the first group occurred six hours thereafter, and was due to a large hæmorrhage that had preceded it.

Of the two deaths following hysterectomy for fibroid, one was due to uræmia, and occurred several days after the operation; the course had been afebrile, and the autopsy showed chronic diffuse nephritis and a clean, dry abdominal cavity. The other occurred within twenty-four hours, and was due to shock; it was the largest fibroid I have ever removed, extending well above the

umbilicus and filling the true pelvis so completely that the finger could not be passed down beside it.

Of the two deaths following hysterectomy for cancer, one occurred within twenty-four hours, and was due to shock; the other occurred after several days had passed without fever, the wound was healed, the abdominal cavity dry.

In the case of gunshot wound, in the fourth group, the bullet entered the epigastrium and made ten perforations of the intestines; death about twenty-four hours after the injury.

In the fatal case of appendicitis the patient had been ill for a week, and had become very much worse a few hours before he was brought to the hospital. There was a large free quantity of pus in the abdominal cavity; death after forty-eight hours.

In all the cases of recovery the wound healed without incident, except in one of double salpingitis; in it there was suppuration of the lower portion of the wound adjoining the drainage opening.

OPERATIONS FOR HERNIA.

	Cases.	Recoveries.	Deaths.	
			Due to Operation.	Wholly or Mainly Independent of Operation.
Femoral; radical cure	4	4		
Inguinal; " "	15	14	1	
" strangulated	2	1	. . . .	1
Total	21	19	1	1

The death after operation for the radical cure of inguinal hernia was in a child of four years. There was nothing unusual about the operation. After his return to the ward the child had several convulsions, got out of bed twice, and died twelve hours after the operation, with a temperature of 106° F. No autopsy. It does not seem to me to be a septic case, but I can offer no satisfactory explanation of the death.

The death after the operation for strangulated hernia appeared to be due to the progress of the infection that had preceded the operation. The recoveries were uneventful.

OPERATIONS UPON THE CRANIUM.

	Cases.	Recoveries.	Deaths.	
			Due to Operation.	Wholly or Mainly Independent of Operation.
Trephining for epilepsy	2	2		
Intracranial neurectomy of fifth	1	. . . .	1	
Abscess of brain	3	1	. . . .	2
Compound fracture of vault	7	7		

The death after intracranial neurectomy occurred six hours after the operation, with symptoms of respiratory failure similar to those produced experimentally by compression of the brain; the pulse was 125 and of good quality until the end.

CLEAN OPERATIONS ON BONES AND JOINTS.

	Cases.	Recoveries.		Deaths.
		Clean.	After Suppuration.	
Removal of fragment of head of radius	1	1		
Fracture of patella; mediate suture	13	13		
Fracture of vertebra; laminectomy	1	. . . .	1	
Curvature of legs, double	2	2		
Genu-valgum, double	2	2		
Vicious union after fracture	3	3		

In the laminectomy the wound showed no effort at repair for more than a week, and then healed slowly by granulation, with only a small amount of pus.

RESECTION OF DISEASED JOINTS.

	Cases.	Recoveries.	
		Clean.	After Suppuration.
Elbow	2	2	
Knee	1	1	
Wrist	1	. . . .	1
Ankle (Mickulicz)	1	. . . .	1
Removal of coccyx	2	2	

The elbow, knee, and wrist cases were tubercular; in the wrist the disease persisted with suppuration. The excision of the ankle was for extensive ulceration of the heel with burrowing of pus in the foot and leg; the suppuration persisted.

Of the two removals of the coccyx, one was done because of pain caused by a dry arthritis of the joint that had led to loss of the cartilage and marked motility of the coccyx. The other was done for coccygodynia.

OPERATIONS ON DISEASED BONES.

	Cases.	Recoveries.
Osteomyelitis	6	6
Tuberculosis	1	1

In most of these cases there was slight, brief suppuration at some point in the wound.

COMPOUND FRACTURES.

	Cases.	Recoveries.	Deaths.	Primary Amputation.
Thigh	5	4	. . . .	1
Leg	13	10	1	2
Foot	1	. . . .	1	
Arm	3	1	1	1
Forearm	4	4		
Hand	2	. . . .	. . . .	2
Pelvis	2	1	1	
Total	30	20	4	6

The first three deaths—leg, foot, and arm—were due to delirium tremens developing promptly after the receipt of the injury. The fourth death—pelvis—was due to shock, the injury being very severe. In the cases treated by amputation, the injuries were severe crushes with so extensive laceration that the preservation of the limb was plainly impossible, or its usefulness, if preserved, lost. In a few instances some loss of skin led to partial healing of the surface by granulation.

AMPUTATIONS.

	Cases.	Recoveries.	Deaths Independent of Operation.
Thigh	3	2	1
Leg	4	4	
Arm	3	2	1
Forearm	3	3	
At shoulder	1	1	
Total	14	12	2

The two deaths were due to sepsis, which existed in one at the time of the amputation, and developed in the other in a coincident lacerated wound of the arm (emphysematous gangrene).

REMOVAL OF TUMORS.

	Cases.	Recoveries.		Deaths
		Clean.	After Suppuration.	
Malignant, external	12	11	1	
Non-malignant, external	4	4		
Cancer of rectum	1	1		
Uterine fibroid, per vaginam	1	1		
Total	18	17	1	

In one case of amputation of the breast, in a very anæmic woman, the wound suppurated freely throughout half its length. Another operation, done on the same day, healed primarily.

MISCELLANEOUS OPERATIONS.

	Cases.	Recoveries.	Deaths.
Ligature of external iliac for aneurism	1	1	
Suprapubic cystotomy	1	1	
Œsophagotomy	1		1
Tracheotomy	1	1	
External urethrotomy	10	10	
Removal of glands of neck	6	5	1
Nephropexy	1	1	
Vesico-vaginal fistula	2	2	
Total	23	21	2

The œsophagotomy was done upon a patient with a large sarcoma of the neck; tracheotomy had been previously done. The patient, who was greatly reduced, died twenty-four hours later.

The death in the case of removal of multiple tubercular glands of the neck took place a month after the operation, and was apparently due to generalized tuberculosis; the wound had suppurated. The other cases healed without suppuration.

A summary of these statistics shows five deaths directly due to the operation (all occurring within twenty hours thereafter), and only one case of suppuration in a primarily clean wound. Two other deaths, after hysterectomy for uterine fibroids and cancer respectively, were hastened by the operation. Of the five deaths by shock, three, I think, should have been avoided by not operating. They occurred late in the service, when I was, perhaps unduly, encouraged to interfere by the almost unbroken record of previous abdominal successes. Two were hysterectomies for cancer and fibroid, one excision of a large cancer of the cæcum. In the case of the fibroid it would have been more prudent to limit the operation to removal of the ovaries, as was done in an earlier case; in the two cases of cancer more weight should have been given to the long duration of the disease, the loss of strength, and the rapidity of the pulse.

Of the death of the child, after an operation for the radical cure of hernia, I can, as above said, offer no explanation. The death after intracranial neurectomy, appeared to be due to necessary pressure made upon the brain in exposing the field of operation.

The absence of sepsis and suppuration in all the clean cases except one, and even in all the purulent cases of salpingitis except one, and the scantiness and rarity of suppuration, even in cases that were suppurating at the time of operation, is very gratifying. The success is, of course, largely due to the skill and faithfulness of the resident staff and of the nurses, especially those of the operating-room, and it emphasizes the advantage of operating in hospital as compared with operating in private houses.

Deeming contamination by the hands the most frequent

cause of infection, we have given especial attention to its avoidance. So far as possible, unclean examinations of other patients are avoided on the day of operation, and occasionally an operation has been postponed because such an examination or dressing has been necessary. The hands are prepared by the usual scrubbing with green soap, are then washed with chloride of lime and carbonate of soda, the latter usually in crystals, and then washed and soaked in a 1 : 1000 bichloride solution. Sometimes we have used chlorine water instead of the chloride-of-lime mixture. The arms of all are bared above the elbow, and sterilized gowns are worn. Basins of the chloride solution are kept within easy reach during the operation, and the hands frequently dipped therein.

Catgut has been used exclusively for ligatures. After prolonged soaking in benzine or ether it is boiled for an hour in 95-per-cent. alcohol, loss by evaporation being diminished by an attached condensing glass "worm." The silk used for sutures, usually black, is treated in the same manner. Both are kept in alcohol before and during the operation.

The instruments are sterilized by prolonged boiling in water, and kept in boiled water during the operation.

Sponges are kept in a carbolic solution before operation, and used from boiled water.

The field of operation is prepared, when time permits, by a soap poultice for twelve hours, followed by a wet 1 : 5000 bichloride dressing for five or six hours. After the patient is placed on the table the part is scrubbed with soap and water, and washed with ether and then with a 1 : 2000 alcoholic bichloride solution.

Hæmorrhage is largely controlled by hæmostatic forceps, as few ligatures (catgut) being used as possible, and every effort is made to limit the contact of the hands with the wounded surfaces.

Vessels are secured in abdominal work, as elsewhere, by isolation and ligation, and ligatures *en masse* avoided as far as possible. To this I attach much importance as affording greater security against hæmorrhage, and also, perhaps, as diminishing

the risk of sepsis because it leaves smaller amounts of devitalized tissue to be taken care of in the reparative process.

Salt solution is used freely in clean cases before closing the wound, and during the operation, if desirable, to wash away blood, or restore the color of the surfaces. In unclean cases 1 : 1000 bichloride is used quite freely during and at the end of the operation.

Drainage is provided for in various ways, according to circumstances. In clean wounds of moderate depth a few spaces about three-fourths of an inch long are left between interrupted sutures; in deeper clean wounds one or two short strips of iodoform gauze are inserted, and occasionally a short rubber tube through a special opening. Unclean wounds are packed more or less extensively with gauze, which is generally removed or much diminished after forty-eight hours.

The details of abdominal work are as follows:

Usually the patient is made to drink warm water freely during the night and morning preceding the operation, with the object of diminishing the subsequent thirst.

In all operations for the removal of the tubes, ovaries, or uterus Trendelenburg's position has been used after the abdominal incision has been made. The intestines are held back by several large flat sponges, the pubic angle of the wound drawn well up with a broad retractor, and one side of the wound drawn well outward with another. Then, if the removal of an ovary is to constitute part of the operation, its artery is secured in one of two ways: if the free border of the broad ligament is long and lax, a catgut ligature is passed through it and tied about the bunch of vessels; if it is short and tense, it is caught and divided between two hæmostatic forceps, and the vessels tied separately on the cut surface between the two layers of peritoneum.

If a distended tube is to be removed, it is patiently mobilized by tearing adhesions with the fingers until it can be raised nearly or quite to the level of the fundus of the uterus, and a catgut ligature is tied about it close to the uterus; it is then divided with scissors close to the ligature, and the incision prolonged beneath it to meet the one made through the ovarian artery, bleeding

points (usually few) being secured when encountered. The divided peritoneal edges along this incision are then brought together with continuous or interrupted catgut sutures. I feel sure that this method consumes no more time and is safer and cleaner than a series of ligatures *en masse*.

If pus escapes, meanwhile, it is caught and removed on stick-sponges, pains being taken thoroughly to empty the pus-cavity before proceeding with the removal of its wall.

In tube cases I have made it a rule to leave one or both ovaries whenever possible, unless the patient was more than forty years old.

A few strips of iodoform gauze are then passed down to the bed of the tube and brought out at the lower angle of the wound, and in cases contaminated by the escape of pus a drainage-tube of rubber is usually added. The exposed organs are freely washed with the salt solution, the flat sponges removed, and the omentum drawn down and spread out over the intestines.

In hysterectomies, after having tied the two ovarian arteries as above described, a long-bladed clamp is usually applied close beneath the tube, and the broad ligament cut across (below the clamp) to the uterus; its cut edges are drawn apart and the uterine artery sought and tied deep down between them. This method of securing the artery is usually more convenient than that of seeking it through a short incision in the posterior layer of the broad ligament parallel and near to the cervix. The long-bladed clamp is used only for the purpose of controlling *venous* flow, and may be dispensed with if the veins are not distended.

After both broad ligaments have been thus divided and the arteries tied, the incisions are prolonged through the peritoneum across the front and back of the uterus, and the anterior one deepened rapidly with scissors until the vagina is entered close beside or in front of the cervix. It is then easy, with the aid of the finger passed through the opening into the vagina as a guide, to carry the incision entirely around the cervix.

Bleeding points are caught and tied, the peritoneal edges of the broad ligaments brought together with sutures, and the anterior and posterior peritoneal flaps that were raised from the uterus

sutured to the anterior and posterior cut edges of the vagina. If the ends of the latter two sutures are left long, they can be drawn out through the vagina and the corresponding peritoneal surfaces thus opposed to each other.

If this plan is fully carried out, no intra-abdominal raw surface is left; the peritoneal covering is everywhere complete, except, perhaps, at the two lateral angles where the stumps of the ovarian arteries may protrude.

I have usually closed the abdominal incision and drained with a strip of gauze extending a short distance into the peritoneal cavity from the vagina; in two cases this drain was accidentally pulled out when the patient was lowered from the Trendelenburg position, and as no ill consequences followed I have since used only a light gauze packing in the vagina.

The abdominal wound has always been closed by a continuous catgut suture along the peritoneum, and silkworm-gut sutures including all the remaining layers. At the point occupied by the gauze drain (at or near the lower angle) a silk or silkworm-gut suture is placed, to be tied after the removal of the drain about two days later.

This temporary gauze drain has been used in all cases, except the hysterectomies in which there is vaginal drainage and a few cases in which the exposure has been very brief. It may do no good in the clean cases, but it certainly does no harm, for the "waiting ligature" insures as prompt and complete union as if the wound had been primarily closed throughout, and it saves the peritoneum from the necessity of taking up the serous discharge and provides an invaluable safeguard if infection should chance to be present.

In the cases contaminated by escaping pus and in those in which a large denuded area has been created by the tearing away of adherent parts the packing is withdrawn from the deeper parts, and often entirely, on the second day. In no case has recovery been interrupted by the formation of a deep collection of pus, and I am disposed to attribute the immunity from this complication to the early withdrawal of the drain.

In cases in which shock seemed great, intravenous injection

of the salt solution—fifteen to twenty ounces—was made. In four cases it seemed to have saved life. I have employed it also in shock following injury without much hæmorrhage, and prompt improvement has immediately followed.

After the operation the patient usually receives no food or drink for about fifteen hours; then water is given in small quantities, and, if this is well borne, milk and Vichy. Vomiting has been slight and often absent. Rectal feeding was resorted to in a few cases where the weakness was extreme and the stomach sensitive. Light solids are begun after two days.

Stimulation, not often required, was effected by enemata of hot water and whiskey and by strychnine hypodermically, in doses of one-sixtieth grain, every half hour until the pulse showed decided improvement. Whiskey was also occasionally given hypodermically.

The bowels were moved on the second day by enemata. Fractional doses of calomel were occasionally used, but seemed to provoke vomiting if resorted to too soon.

The cases of appendicitis numbered twenty. In all except two, one of which was the fatal case, the appendix was removed. With these may be considered thirteen others in which in the course of a laparotomy undertaken for the relief of some other affection (ten pus-tubes, two ectopic gestations, one ovarian cyst) the appendix was found to be diseased and was removed. All the latter recovered.

Dr. McBurney's intermuscular parietal incision was employed in almost all cases except those in which a manifestly large collection of pus was present. The centre of the cutaneous incision was placed about an inch and a half within the spine of the ilium, and the fibres of the deeper muscles separated a little below that point. In a few of the cases operative difficulties encountered within the abdominal cavity made it necessary to divide the internal oblique and transversalis at their mesial border so as to gain more room, but this created no disadvantage as compared with the old method of their primary division in the line of the cutaneous incision, and some of the special advantages of the method were still retained by subsequently suturing the second division and draining through

the gap made by the primary separation of the muscular fibres. It will be recognized that I have thus given a much wider application to the method than is approved by its distinguished author, but I think the experience shows that this can be safely done.

In the removal of the appendix one or two catgut ligatures are placed upon its mesentery, and the latter divided back to a point about half an inch from the junction of the appendix and cæcum. The appendix is then divided nearly across, the small point of the Paquelin cautery passed into the lumen to destroy the mucosa, a catgut ligature tied about it, and the division completed. In one case the appendix was so soft that it tore away in the handling, and the stump was so deeply seated and so adherent that I could not conveniently place a ligature about it. It was therefore left open, with only the protection of a gauze drain, which was withdrawn after a few days. Nothing occurred to indicate any contamination of the wound, and the patient made a prompt and uneventful recovery. The unfailing success of this simple form of ligation seems to indicate that it may be safely preferred to the more complicated methods that have been devised.

In cases in which pus is present, either circumscribed or free, with considerable turbid serum about the neighboring loops of intestine, I have carefully removed the pus and serum with sponges, washed the exposed parts rather freely with warm salt solution, and packed rather lightly with gauze, sometimes using, in addition, a rubber drainage-tube, and always narrowing by suture the parietal opening to an inch or an inch and a half.

Occasionally a piece of iodoform gauze has been spread over the adjoining intestines above and to the inner side, between them and the wall. The latter has always been promptly withdrawn, after forty-eight hours, and the rest of the packing partly withdrawn at the same time. Its entire removal has soon followed, never later than a week, and then, when the "intermuscular method" has been used, the sides of the parietal opening have been brought together with sutures, one or two deep ones first approximating the peritoneum and fascia, the others bringing together the muscle, fascia, and skin. This has always given

me a firm cicatrix, and no case of hernia after this use of the "intermuscular method" has come to my notice.

In the case of gunshot-wound of the intestines four of the ten perforations were so close together and so large that I excised the corresponding portion. In making the following end-to-end suture and in uniting the small intestine with the colon in the case of cancer of the cæcum I used the potato button recommended by Landerer.[1] Neither case survived long enough to show the ultimate result, but the convenience of the method and the sufficiency of the primary closure were amply demonstrated. The button was made at the time by cutting a potato to the shape of an egg, about two inches long and an inch in diameter, with a groove about a quarter of an inch wide and deep at its equator, and a central longitudinal canal. Into this groove the ends of the intestine were drawn and secured by a purse-string suture and a few Lembert sutures. It seems to be an efficient and convenient substitute for the Murphy metallic button.

In the operations for the radical cure of inguinal hernia Bassini's method was employed; silkworm gut was used for the deep sutures, and the wound was closed without drainage. No inconvenience followed from the use of these non-absorbable sutures.

Of the three abscesses of the brain, one followed ethmoid disease, and was opened through the orbit. The patient lingered for some weeks and then died. The other two were secondary to suppurating scalp wounds, one of them with a very slight fracture of the external table. In the fatal case the immediate cause of death was double pneumonia, in the third week; there was slight non-suppurative meningitis, and suppuration in the middle and internal ear and mastoid cells of the opposite side, no symptoms of which had been observed during life.

The fractures of the patella were all treated by open mediate silk suture, passed through the tendon of the quadriceps and the ligamentum patellæ and crossing the front of the bone. The incision was usually longitudinal and median, but in two cases it was semicircular around the inner side of the bone. The object

[1] Centralblatt für Chirurgie, March 30, 1895.

of this variation was to avoid the adhesion which sometimes takes place between the scar and the wound, and thus makes it probable that a refracture will be compound.

The operation is done without touching the wound with the fingers. As soon as the joint has been exposed the fragments are drawn apart with retractors and the cavity washed clean with warm salt solution; then the fringed fascial and fibro-periosteal layers are picked out and trimmed when necessary, the fragments brought together by sharp hooks inserted above and below them, the soft parts covering the line of fracture spread out, and the suture applied by means of a curved needle. Occasionally I have used catgut sutures through the fibro-periosteum instead of the mediate silk suture, and occasionally I have placed one or two catgut sutures in the torn lateral expansion.

The advantages of the operation as compared with non-operative treatment I conceive to lie in the prompt removal of blood from the joint and in the exact reposition of the fragments; and the advantages of the method of operating, as compared with others, are found in the slight extent of the interference and the exposure, and in the absence of any communication during repair between the cutaneous incision and the joint, so that if any suppuration should occur about the sutures it would be less likely to extend to the joint.

All of the external urethrotomies but one were done under cocaine anæsthesia, and to this I attribute the simplicity of the subsequent course and the absence of dangerous constitutional reaction and complications. Nine were cases of deep organic stricture of long standing, two of recent traumatic rupture of the urethra. I have employed cocaine anæsthesia almost exclusively in this class of cases for several years, even when it was necessary to operate without a guide, and have never had any difficulty in completing the operation or observed any evidence of cocaine-poisoning. Only the 2-per-cent. solution has been used. It is first thrown into the urethra, retained for a few moments, and followed by an injection of oil. A filiform bougie can then generally be passed, even when this could not previously be done. The cocaine is then injected along the median line of the peri-

neum and the operation proceeded with in the usual manner. Generally no pain is felt before the neighborhood of the urethra is reached, and it is seldom sufficient to require the additional injection of cocaine in that region.

In closing, I may be permitted to state some conclusions that may be drawn from our experience,—

(1) It may be confidently expected that, with the aid of assistants trained for and constantly exercised in the preparations for and the conduct of operations, and with special attention to the cleanliness of the hands, a clean surgical wound will escape infection and will heal without suppuration, but that without such skilled aid and without the security given by the constant practice of the assistants in hospital the same measure of success is not to be expected.

(2) It is probable that a certain measure of infection by germs in the air or in the patient himself takes place in an unknown proportion of cases, but that it is habitually so slight that the resistant powers of the tissues are able to prevent its manifestation and spread; we are, perhaps, justified in offering the low vitality of the patient as an explanation of the occasional sporadic cases of suppuration that occur in long series of otherwise successful operations.

(3) We have in large intravenous injections of salt solution, during or after an operation or a severe injury, a valuable means of averting an impending death by shock or hæmorrhage.

(4) Habitual immunity from infection creates an operative confidence that may lead to a neglect to give full weight to such warnings or contra-indications as might be found in the probable severity of the operation or in the reduction of the patient's vitality, especially in malignant disease.

THE OPERATIVE TREATMENT OF ULCER OF THE STOMACH, WITH REPORT OF A RECENT SUCCESSFUL CASE.[1]

By CHARLES T. PARKER, M.D.,

OF NEW YORK.

ACCORDING to Welch not less than 85 per cent. of ulcers of the stomach heal spontaneously, yet it is not the ulcer itself, but the special indications in each case which require any interference on the part of the surgeon.

In the first line stand such ulcers as involve the pylorus and produce a stenosis at that point, for which resection of the pylorus, pyloroplasty, or excision of the ulcer and gastro-enterostomy are indicated. Which of these methods is to be selected can only be determined at the time of the operation.

In the second line come ulcers of the stomach, from which repeated and uncontrollable hæmorrhages issue. It indeed rarely happens, yet operations have been performed for the removal of such ulcers, and with recovery. Mickulicz, Küster, and Roux have had brilliant results, and have saved their patients by laparotomy, together with a suture, excision, or cauterization of the base of the ulcer.

The third indication is the perigastritis, localized peritonitis, and the results from the cicatricial adhesions of the stomach with neighboring organs, such as adhesion between the stomach and the pancreas, and the interference of its function, and, finally, gastrectasia. Rosenheim has operated for persistent gastralgia, in which he separated adhesions between the liver and stomach; Hahn, gastralgia from adhesions between the colon and the stomach; Robson, gastralgia from adhesions between the

[1] Read before the New York Surgical Society, April 8, 1896.

stomach, the gall-bladder, and the liver; Terrier, Lauenstein, and Hofmeister have operated for the same cause. Finally, while the stenosis exists at the pylorus in every case of ulceration, one danger is always imminent,—that is, sudden perforation and the production of a foudroyant septic peritonitis, except possibly in those cases where the stomach at the time of the perforation is empty and has been kept empty after the operation. This complication, though rare, is not sufficiently so to allow one to avoid its consideration. In the diagnosis of the origin of a general peritonitis its occurrence is probably greater than 13½ per cent., as stated by Brinton. It is a fortunate fact that 80 per cent. of these ulcers followed by perforation have their situation on the anterior surface of the stomach, and although the danger of a general peritonitis is thereby enhanced, nevertheless the chances for ă good and rational treatment are better and more likely to be satisfactory. An ulcer occurring in this situation may be followed by three phases: First, and most frequently, a general peritonitis; second, an opening into a neighboring viscus and the formation of a fistula; and, lastly, an adhesive peritonitis and encapsulation either between the liver and the diaphragm, the liver and the stomach, or the spleen and the stomach. Taking into consideration the fact that general peritonitis is so much more the rule than the other varieties, it is beyond doubt that a careful study of the premonitory symptoms of an ulcer of the stomach should be considered. When all the symptoms are analyzed there are but two which may be considered diagnostic: one a sharp rapid pain in the epigastrium with the sensation of something tearing inside, sometimes coming on severely without antecedent phenomena, and sometimes preceded by the classic signs of ulcer of the stomach; second, the signs of general peritonitis by perforation, a type of well-defined symptoms, or by the signs of a localized peritonitis with encapsulation at least for a certain period. This perforation of an ulcer is a complication almost always fatal, since the infection, if localized, is scarcely less dangerous than the general infection, and the cicatrization or adhesions with the neighboring viscus is not in itself without grave ulterior consequences.

The medical treatment in these complications accomplishes practically nothing, exploratory laparotomy can alone assure one of the diagnosis and afford rational treatment. To be efficient it must be done early, and if the perforation is found and the peritoneum infected one must make the necessary toilette of the peritoneum and suture directly, resect and suture, or perform a gastro-enterostomy. If the ulcer is difficult of access and the above conditions cannot be carried out in their entirety, one is forced to suture and pack the cavity with gauze, having secured a good toilette of the peritoneum, or to pack alone.

The results of the early laparotomy have been encouraging enough to force one to proceed in the attempt to make an early diagnosis and to hope for even better results in the future than in the past. The results at the present day are certainly better than those of ten years ago. Pariser reports eleven recoveries in forty-three cases; Schuchardt reports two cases of recoveries; Heusner, three cases which were fatal; Comte, who very lately collected the statistics upon this subject, has found nineteen recoveries in sixty-five cases.

The following case was characterized by the symptoms of an antecedent gastritis, fixed pain in the epigastrium, and an observable induration in the epigastric region. The operation revealed an ulcer so near the point of perforation that the difference in tension within the abdomen, brought about by the incision, caused its rupture. On account of induration of the wall of the stomach surrounding the ulcer, I thought it better to treat the case without immediate suture.

M. N., twenty-five years of age, and by occupation a stewardess, was admitted to the Hudson Street Hospital on March 4, 1895. She said that for two months she had been unable to eat solid food without pain in the epigastrium; that she had had a constant pain during this time, with occasional vomiting and a great loss of flesh from inanition. The lungs, heart, and kidneys were normal. The menses had not appeared for three months, and a vaginal examination revealed a chronic endometritis and laceration of the cervix. Her temperature at time of admission was 101° F., pulse 92. An examination of the abdomen revealed a distinct point of tenderness in the

epigastrium, apparently beneath the liver and in front of the stomach. There could be also felt an area of induration two to four inches in diameter. When pressure on the abdomen was made at any point, the pain was referred to this region.

On March 5 the stomach was thoroughly washed out and a large enema given. This was repeated on the following day before the operation.

On March 6 the patient was etherized and the abdomen was thoroughly cleansed. An incision was made in the median line, three inches long, just below the ensiform cartilage. As the incision was carried down to the peritoneum it could be plainly seen that one had to deal with a mass of adhesions binding the stomach to the liver. When the incision was made through the peritoneum the stomach could be felt bound to the liver above and free below. On introducing the finger an indurated area was felt on the anterior surface of the stomach below the mass of adhesions, binding the lesser curvature to the liver. On withdrawal of the finger, the contents of the stomach and mucus escaped in the area laid bare among the intestines. The exposed area was thoroughly washed out with a salt solution and was packed with sterile gauze over which a sterile dressing was applied.

The wound was dressed daily with the intention that as soon as the infection was over a suture of the stomach wall would be undertaken, if necessary.

After the second day the discharge and odor from the cavity were diminished. This continued for one week, when the wound began to granulate. During the first five days following the operation the nourishment was entirely by the rectum. Her temperature remained about $100\frac{4}{10}°$ F. and pulse 96.

At the end of a week milk was given by the mouth. She continued on fluid nourishment by the mouth until March 25, at which time a small fistula remained, through which none of the contents o the stomach escaped. She was discharged from the hospital on May 7 with a small fistula, which in the course of two months healed. She is at present enjoying good health and attending to her daily duties as a stewardess upon a coastwise steamer.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, March 11, 1896.

ANDREW J. MCCOSH, M.D., in the Chair.

LIGATION OF THE VASA DEFERENTIA FOR HYPERTROPHY OF THE PROSTATE.

DR. F. TILDEN BROWN presented a case, a man, in whom ligation of both vasa deferentia had been done for hypertrophy of the prostate. The man was a cab-driver, seventy years of age, who first had symptoms of urinary retention five years ago. He entered the Presbyterian Hospital in June, 1895, unable to pass any urine. Catheter No. 17, French, was passed. The urine contained a trace of albumen, some pus, and muco-purulent shreds; no casts. The prostate as explored by the rectum was hard and about the size of a billiard ball. The meatus was enlarged so as to admit 32 French, and for more than ten days he was regularly catheterized. As this and sitz-baths, etc., gave no relief from the retention, on July 11 he performed the operation suggested by Dr. Mears. The vasa deferentia were separated to the extent of an inch from the cord and double ligatures of fine silk were placed a quarter of an inch apart on each vas. The vas was not severed. At the end of seven days it was reported that he had passed urine by drops to the amount of about two drachms. Three days later he passed two ounces, and from that time the amount passed voluntarily increased, while that drawn by catheter decreased. August 1 five ounces were drawn by catheter, twenty-eight ounces were passed by urethra. On the date of his discharge, August 12, three ounces were drawn by catheter, thirty-eight ounces were passed by urethra. He returned to his work as a cab-driver, and had since had more comfort than he had experienced at any time the previous ten years. He gets up once during the night, and throughout the day urinates once in three or four hours. He uses the catheter once a day, on retiring. Dr. Brown had found

only two to three ounces residual urine in subsequent tests. It was clear and free from albumen and muco-purulent matter. He was inclined to believe the improvement was due to the operation. Helferich had lately reported ten cases treated in the same way with very satisfactory results, the patients being enabled to dispense with the catheter. Frequency and tenesmus disappearing as well.

There had been no atrophy of the testicles since the operation. The prostate was softer than it was and smaller. It is now about the size of a hen's egg, the left lobe being about three times as large as the right.

OLD DISLOCATION WITH FRACTURE OF THE NECK OF THE HUMERUS.

Dr. B. Farquhar Curtis presented a boy, fourteen years of age, on whom he had operated four weeks after an injury resulting in dislocation of the shoulder with fracture of the neck of the humerus. The injury had taken place in November, but its severity was not understood, and until he saw the patient the treatment had consisted simply in putting the arm in a sling. Dr. Curtis found the head of the humerus dislocated below the coracoid process, and the surgical neck fractured. The arm was almost painless, but there was great limitation of motion. The elbow could not be raised from the side at all, scarcely any rotation was possible, slight antero-posterior movements alone could be made voluntarily at the shoulder joint. Passive motion was somewhat more extensive. He made an incision, three or four inches long, vertically downward from the acromion, opening the capsule and exposing the head of the humerus. With a hooked instrument, like one described by Dr. McBurney, inserted into a drill-hole made in the upper fragment, he tried to replace the head, but the bone was too soft, the hook tore out so that the head could not be moved in this manner. He was, therefore, compelled to divide capsular bands freely wherever there seemed to be any tension, and by means of blunt instruments used as levers and with his fingers was finally able to force the head into the glenoid cavity. The shortening was considerable,—two inches,—the fracture was transverse, and he found it impossible to bring the fractured ends into correct apposition until he had removed about half an inch from each fragment. He then had broad bony apposition. The head of the bone was rotated inward, and as he could not rotate it outward he put the arm up in inward rotation, too. This explained why there is now

greater inward rotation than normal, and outward rotation is limited. Primary union was obtained in ten days, slight passive movements were begun on removing the dressing at that time, and were practised more freely and systematically after three weeks. At present he could lift the arm forty-five degrees from the vertical without motion of the scapula, and was constantly gaining. The attempts to secure motion had been interrupted for two or three weeks after he left the hospital by an accident to the elbow caused by a fall. It is now three months since the operation, and the functional result is excellent.

LATE SUTURE OF DIVIDED TENDONS; RESTORATION OF FUNCTION.

DR. R. H. M. DAWBARN presented a man, twenty-six years of age, who, about ten weeks before he saw him last fall, had sustained an injury of the left hand, resulting in complete division of the flexors of the index and middle fingers at the palmar junction. He had no power of flexion of the phalanges supplied by the long flexor tendons. Dr. Dawbarn made an incision, and had no trouble in finding the distal portion of the tendons, but had to go up nearly to the anterior carpal ligament to find the proximal portions. By strong traction he was able to approximate the two ends to within an inch and three-quarters of each other. Each tendon was united by four distance-sutures of silkworm gut, which spanned the space of an inch and three-quarters. The hand was kept flexed about five weeks. The result had been excellent, the man had probably as strong a flexor power in those fingers as in the others, and evidently new tendon had formed among the sutures. He could not fully extend the two fingers, but ability to do so would probably come with use. Perhaps it would have been better not to have kept the hand flexed so long, but as he was a laboring man Dr. Dawbarn had chosen the safer side.

RECURRENT CARCINOMA OF NECK FOLLOWING CARCINOMA OF TONGUE.

DR. CHARLES K. BRIDDON presented a man, twenty-four years of age, who, on August 28, 1895, had been subjected by Dr. Eliot to excision of the tongue, after the method of Kocher, for carcinoma. The patient made an uneventful recovery from that operation.

About January 1, 1896, a lump the size of a marble was noticed just under the inferior maxilla on the left side. Two weeks later it had increased considerably in size. No evidence of recurrence *in loco*.

When seen by Dr. Briddon, February 5, 1896, the whole left side of the neck was found infiltrated, reaching from the under surface of the jaw to a point two inches above the root of the neck, all the structures were matted together, and it was determined to shape the incision so as to make a preliminary ligation of the carotid.

An elliptical incision was made, excising the cicatrix of previous operation, which was adherent. From the centre of this, incision was prolonged downward and outward, parallel with the anterior border of the sterno-cleido-mastoid muscle, exposing the platysma, and after incision of this structure, the sterno-mastoid itself. The omo-hyoid was now exposed anteriorly and the sheath of the vessels opened, both artery and vein appearing in the wound. The artery was ligated in the angle between the two muscles and a ligature passed around the vein. The mass consisting of a number of glands inseparably united to each other and to the parts around, was found adherent to the thyroid cartilage and hyoid bone, and above extended into the parotid. This was now excised, the external carotid and internal jugular vein being divided as they entered the parotid gland and tied. The internal carotid also divided one inch above bifurcation; the mass being adherent closely to the vessels. In the subsequent separation of the mass from the sides of the hyoid and thyroid it was found necessary to excise a portion of the lateral wall of the pharynx, to which they were adherent, just above the greater cornu of the hyoid bone. The longitudinal rent was sutured with continuous silk. The mass of glands and the parts to which they were adherent comprised the upper portion of the common carotid, an inch of the internal carotid, an inch and a half of the external carotid with its branches, the corresponding portion of the internal jugular vein, and about one inch of the pneumogastric nerve, also the hyoglossus and mylo-hyoid attached to the hyoid bone and the lymphatic tissue and glands. The hæmorrhage was considerable, especially the venous, which was oozing, and the patient took the anæsthetic poorly throughout the entire operation. All ligatures used were of catgut. Flaps of wound brought together by interrupted sutures, a tampon of iodoform gauze being introduced down to pharyngeal wall.

The patient rallied well from operation.

For forty-eight hours he received nourishment by rectum. The wound was dressed on the second day after the operation and daily afterwards. Fluids given by mouth on the second day appeared in the wound. This leakage of food through the wound persisted for one week, when it gradually closed.

Patient sat up out of bed and walked on the fourteenth day after operation. He has been unable at any time to speak above a hoarse whisper. He was discharged from the hospital in excellent condition in less than one month after the operation with two small sinuses, which do not communicate with the pharynx.

Laryngeal examination, made March 10, 1896, by Dr. Simpson, showed the epiglottis to be much reddened and œdematous, especially on the lingual side. The interior of larynx very hyperæmic. The right side of larynx moved freely. Absolute immobility of the left side. Left vocal cord is stationary in the median line with slight swelling of left side of larynx. Phonation is produced entirely by right cord coming over to meet left stationary cord. Great amount of secretion collected in lower pharynx.

DR. F. KAMMERER thought the result of the operation in Dr. Briddon's case of recurrent carcinoma of the neck was an exceptional one. In resecting large tumors of the neck, he had, on many occasions, taken out several inches of the jugular vein, and had repeatedly exsected a portion of the pneumogastric nerve. He had also tied the common carotid in two such cases, but these had died some days after operation with symptoms of cerebral anæmia and hemiplegia. Section of the pneumogastric nerve, when involved in the tumor, was followed by very slight symptoms, if any. In only one case, as soon as the nerve was divided the pulse became accelerated from 90 to 130, but the patient recovered from the operation, which was performed for sarcoma of the neck.

RESULTS OF CASTRATION FOR HYPERTROPHIED PROSTATE.

DR. L. S. PILCHER read a paper with the above title, for which see page 687.

DR. CHARLES K. BRIDDON thought the series of cases reported by Dr. Pilcher ought to be regarded as surgical triumphs following the introduction of the operation by Dr. White. His own experience had been small, and he would only refer to one case which was under his care at the present time, and which resembled the fourth one reported

in the paper. The man was now seventy years of age, and had first entered the Presbyterian Hospital in 1892, suffering excessively from prostatic trouble. Suprapubic section was made, the middle lobe of the prostate was removed, and for a time the operation was followed by considerable relief. The suprapubic wound was kept open as long as possible, and had since then opened spontaneously at times. The man returned to the hospital again a few months ago with his old symptoms increased in intensity. He was passing his water every half hour, and the act was associated with very considerable pain. Dr. Briddon removed his testicles in the early part of January, 1896, after which a form of mental disturbance developed similar to that described by Dr. Pilcher. He tore his bandages off and infected the wounds on both sides, and they were still unhealed. He was wayward and suffered from nocturnal delirium, but during the last week or two his mental condition had markedly improved. He now urinated only fifteen times in the twenty-four hours and had no pain, while on admission he passed his water every half hour.

DR. F. KAMMERER said his experience with castration for prostatic trouble had been limited to one case, that of a man seventy years of age, in which case symptoms had existed for three years and had become so severe that he submitted to castration last August. The immediate result was not good, while the remote result was. No improvement took place for five or six weeks, some sloughing occurring from post-operative infection, but at that time he began to pass his water voluntarily. Previously the urine had simply dribbled away, leaving a residual amount of about fifteen ounces, and he was compelled to get up as many as nine times every night. At present he urinated only three times a day, once at night and the residual urine had decreased to an ounce and a half or two ounces. The catheter was still used once or twice a week, and the bladder was washed out for a cystitis, which, as yet, had not entirely subsided.

DR. DAWBARN said his experience was also limited to one case, that of a man sent him by Dr. F. Spencer Halsey for prostatic enlargement, urethral stricture in the penile portion, and perineal fistula. He gave a history of prostatic abscess, which burst externally without assistance a year previously. When Dr. Dawbarn saw him he was passing nearly all of his urine by the perineal fistula, very little by urethra. After washing out the bladder and succeeding in passing only the smallest-sized catheter through the urethra, he performed internal urethrotomy. He also proposed castration, to which the

patient acceded, and it was done a fortnight after the urethrotomy. Three weeks subsequently there was much improvement. A catheter several times larger could be passed through the prostatic urethra, and he was able to make water much more freely. Then suppression of urine developed suddenly, with delirium; of which complications he died within forty-eight hours. It was suspected that a new nurse had employed a dirty catheter which caused infection. Dr. Dawbarn remarked that all the previous speakers had referred to castration for prostatic hypertrophy as White's operation. He inquired whether Ramm, of Christiania, was not first in this field.

Dr. Willy Meyer thought the progress made by surgery in this formerly so very intractable class of cases was very gratifying. The cases reported by Dr. Pilcher spoke for themselves. Still, he thought we ought to consider well the more simple operation referred to by Dr. Brown, of tying the vas deferens or exsecting a portion of it. It being a fact that the continuity of the vas deferens had never been restored after division, it would seem that subcutaneous division might do as well as excision or ligature. In his opinion, therefore, we ought not at once to propose to these patients the extreme measure of removing both testicles, but should first do one of these simpler operations under cocaine, and if that did not succeed it would still be time for castration.

Not infrequently prostatic enlargement began at forty or forty-five years of age. He had often seen enlargement in men under fifty. Such patients might still desire to become fathers, and he wished again to call attention to Bier's operation for such cases. It consisted, as well known, in ligation of both internal iliac arteries, whereby it was hoped to bring about atrophy of the enlarged prostate in a manner analogous to what was seen in ligation of the uterine arteries for fibroids. Dr. Meyer had performed this operation six times in three patients, although, it must be admitted, not with very gratifying results. The operation had, on account of possible dangers, so far not received a fair trial by surgeons in general, yet seemed to have its indication in the above-named cases.

He also called attention to a report by Professor Englisch, of Vienna, on feeding patients with beginning symptoms of prostatic hypertrophy with prostate tablets made of the gland of bullocks.

Dr. Meyer mentioned the case of a man in his sixties who had an abscess in the hypertrophied prostate, which he opened by transverse perineal incision. In the course of the after-treatment sup-

purative inflammation of the testicles developed, for which he performed double castration. This was until now not followed by the slightest effect on the hypertrophy of the prostate. Castration had been done three months ago.

DR. F. TILDEN BROWN considered himself fortunate to have heard these very accurate statistics in Dr. Pilcher's cases of castration for prostatic hypertrophy. In view of the eager rush on the part of some to do the operation on the slightest indication, and with the expectation of having a magical change from perhaps complete retention to free emptying of the bladder, he thought Dr. Pilcher's paper was of very great value. While it showed some brilliant results, it showed also some good results with temporary qualifications, and it showed one case of but trifling improvement. Altogether it was a most valuable contribution to the subject.

What he was about to say regarding the procedure suggested by Dr. Mears and practised by himself in the case shown this evening, had been said for him by Dr. Meyer. He would like to urge a more extensive trial of cutting off the lumen of the vas deferens. While there was no explanation known to him for returning functional ability of the bladder before the occurrence of any appreciable shrinkage or atrophy of the glandular elements of the prostate, yet it was seen to take place in many instances after double ligation of the vasa deferentia and also after castration. He would recommend that double ligation be done first, if for no other reason because it obviated the necessity of a general anæsthetic. He had hoped that Dr. White would make some statement with regard to double ligation in men, since he very promptly began experimenting with it on dogs when it was suggested by Dr. Mears, and reported that in those animals the atrophy of the prostate equalled that which followed double castration.

DR. PILCHER closed the discussion by remarking upon the case reported by Dr. Brown. There seemed to be a pretty general unity of experience that considerable improvement does follow in cases of prostatic overgrowth with obstructive symptoms from ligation or excision of a portion of the vas deferens. The later history of these cases is still unknown, and it is important that a number of them should be followed up and reported. All surgeons are anxious for exact information with regard to the relations which exist between the testicle and the prostate. If the relation is one simply dependent on the flow of the secretion of the testicle through its outlet through

the prostatic portion of the urethra and the stimulation which it may excite there, then it was easy to understand that by ligation or excision of a portion of the vas deferens this source of stimulus would be removed and a state of quiescence and possibly of atrophy of the gland might follow; or it might be that the general disturbance of the genital tract produced by excision of the vas deferens might, by its reflex action, produce certain trophic changes in the prostate. But to what extent the atrophy would be produced, or whether it would be permanent, were questions of great interest. Whether there might not still remain a relation between the testis and the prostate which would ultimately overcome the effect primarily produced by removal of a portion of the vas deferens and cause the gain which had resulted from the operation earlier to be lost later, was a question yet to be decided, and a question of the greatest importance. One thing certainly was well established,—namely, that there is a very close interdependence of the nutrition of the prostate and the functional activity of the testis. Personally, he had not felt himself at liberty in the cases he had detailed in his paper to resort to what might seem to be experimentation. They were grave enough in their conditions to demand, if anything should be done, something which gave him reasonable certainty of bringing to them relief, and, therefore, he proposed to them at once removal of the testicles. The operation being accepted by them, it did not seem to him that he would be justified in proposing a substitute which might neither prove so perfect in accomplishing the end, nor so permanent in its results.

The same reason that would influence a surgeon to throw aside prostatectomy, either through the bladder or through the perineum, for some less dangerous operation, would lead, likewise, it seemed to him, to the rejection of the operation of Bier, which had again been brought to attention by Dr. Meyer. For, as had been remarked, it was an operation attended with very considerable danger, and should a mischance occur in connection with it, the probabilities of very grave disasters following it were great.

The immediate benefit which resulted from the operation of castration seemed to be due to three causes: First, a diminution of congestive turgescence; second, a diminution of glandular œdema; third, a decided and rapid atrophy of the gland-cell elements.

By the diminution of the swelling, either congestive or œdematous, and the shrinking of the gland-cellular elements during the first

few days or week or two, results the noticeable early improvement noticed in the cases. The immediate advantages obtainable, he would suppose, from the experience which he had detailed in his paper, would come within the first two or three weeks, and then there would be a halt. Little marked advantage could be expected after that until some time had elapsed. Months afterwards, as he had stated in the histories of his cases, very little change, either in the still persistent obstructive symptoms or in the apparent size of the prostate as felt by the finger was noted. But when a much longer time had lapsed, as in the case which had been longest under observation, a year, the marked atrophy of all the constituents of the gland was beyond question. And it was in that particular point, it seemed to him, that the advantage of removal of the testicles was prominent.

With regard to the case mentioned by Dr. Meyer, it was to be noted that the case had been under observation only three months. What might yet occur from removal of the testicles in the way of shrinking of the prostate, we did not know. He might, therefore, be pardoned if he did not accept that particular case as having any special bearing upon the general question of the ultimate effect upon the prostate of removal of the testicles.

As to the surgeon who first performed removal of the testicle for relief of obstruction to the urine, he did not think there could be any question. The credit of that must be given to Ramm, then of Christiania, now of Tromsoe. As to whom should be given the credit of scientifically demonstrating the relation between the prostate and the testes, and establishing upon certain and sufficient ground the operation as a surgical procedure, likewise there could be no question. That was undoubtedly due to White, of Philadelphia.

A SIMPLE METHOD OF DRAINING THE BLADDER AFTER SUPRAPUBIC INCISION.

DR. ROBERT H. M. DAWBARN demonstrated a simple method of draining the bladder. It was one which he had shown his classes at the polyclinic for several years, and he would not have thought of calling attention to it on this occasion had he not noticed in a recent number of the ANNALS OF SURGERY a method, hardly so simple, described by Dr. Keen. In his article Dr. Keen stated that his method was a modification of an English procedure. In justice to American ingenuity, Dr. Dawbarn wished to say that the principle was first em-

ployed by an American, Dr. Snow, a dentist, of Buffalo, N. Y., nearly twenty-five years ago, and it had been used ever since by dentists as a means of keeping the mouth dry during dental operations. The method is described in the April number of the ANNALS OF SURGERY, page 499.

SARCOMA OF KIDNEY.

DR. KAMMERER showed a kidney removed from a woman sixty years old. The abdominal growth had been noticed by the patient for the past six years. It had increased slowly, but during the last month or two the patient claims that it grew very rapidly. She had never noticed blood in her urine. When first seen by the speaker about five weeks ago, she was much run down, with poor development of adipose and muscular tissues, but had no distinct cachectic appearances. Through the loose abdominal walls a tumor, occupying almost the centre of the abdomen, but still lying a little to the right, could be readily felt, its size being about that of a man's head. It was very movable, permitting a change of position into most any part of the upper abdomen, and on bimanual palpation from the right lumbar region gave the impression but very indistinctly that it belonged to the right kidney. Its surface seemed to be smooth. The examination of her urine was negative. Cystoscopy showed that there was no secretion of urine from the right ureter into the bladder. Inflation of the colon under ether, however, was of great diagnostic value in this instance. The distended ascending colon lay on the inner and upper side of the growth, passing almost over the lower pole of the latter. This left hardly any doubt in his mind that the tumor belonged to the right kidney, even if its great mobility and dislocation from the lumbar region were a little puzzling. He decided to do the transperitoneal operation for this very reason, although he preferred to attack most any kidney tumor by the lumbar route. Upon opening the abdomen a few slight adhesions were found with the small intestine, and were easily separated. The tumor had grown into the mesocolon ascendens, and the ascending colon itself was seen lying as a flat band on the inner side of the tumor, with its mesentery spread out as an investing membrane over it. He therefore incised the peritoneum over the most prominent point of the latter and enucleated the growth. Here he experienced some difficulty in pealing off the colon and not injuring its nutrient vessels, and after a good deal of tedious dissection the large retroperitoneal vessels were finally reached, ligated, and the growth re-

moved. There then remained two large folds of peritoneum; upon the inner one the ascending colon rested. Considering the large wound surface and the manipulations during enucleation he decided to drain, and with this purpose in view he stitched the folds to the parietal peritoneum of the incision, thus practically closing the peritoneal cavity. The abdominal wound was closed, with the exception of its middle part, through which an iodoform-gauze tampon passed into the wound-cavity. The patient made a slow but uneventful recovery for the first four weeks. The large tampon was definitely removed on the fourth day and only a very small one inserted in its stead, which remained for several weeks, being frequently changed. At the end of the fourth week a small sinus was still left leading into the abdomen for about two inches. At this time the patient was unfortunately seized with complete hemiplegia of the right side, due to embolism from pulmonary thrombi, to which she succumbed a week later. The tumor proved to be a cancer. The post mortem showed no metastatic deposits in any organs, but marked granular degeneration of the remaining kidney, which was diminished in size.

TUMOR OF THE BRAIN.

DR. F. KAMMERER also showed the brain of a woman, twenty-eight years of age, whom he had operated on in June and September of 1893, for the relief of intracranial pressure, by removing, first on the right and then on the left side, large pieces of both parietal bones.

The case was shown, markedly improved, at the meeting of this society, February 28, 1894, and is reported in Volume XIX, ANNALS OF SURGERY. In the further course of the case the protrusion of the right bulbus oculi became more pronounced, and the patient complained of such severe pain in the orbit that it was deemed advisable to remove the eyeball, about a year after the first operation. This was followed by some relief. The tumor could then be felt in the posterior part of the orbit, when moderately firm pressure was exerted. The hemiparesis and hemi-anæthesia on the right side became much improved some months after the operation, and continued thus until spring of 1895, when the paretic symptoms became more marked again until the patient's death, which occurred in November, 1895, from sudden hæmorrhage from the nose and mouth of a most profuse character. During the last two or three months she was confined to bed and suffered excruciating pains, more especially on the right

side of the head, which no internal medication seemed to benefit. About one year prior to her death she complained of impairment of vision, which in the course of a few months resulted in total blindness also of the left eye.

At the post-mortem examination, by Dr. Eugene Hodenpyl, a large tumor was found to occupy the base of the right half of the brain, encroaching upon the temporal and frontal lobes. The anterior portion was firmly attached to the upper wall of the orbit and had to be torn away, when it was seen to have grown into the orbit, having perforated the great wing of the sphenoid, causing erosion. Very likely the internal maxillary artery was the source of the fatal bleeding, which point could not be definitely determined.

The posterior part of the tumor contained a cyst, the anterior was solid, and proved on microscopic examination (Dr. Hodenpyl) to be a giant-cell sarcoma. The tumor was situated well within the brain, being covered by the margin of the temporal lobe on its lower surface. The position of the tumor readily explains all the clinical symptoms, with the exception of the hemiparesis and hemi-anæsthesia on the same side, for which no lesions were found in the left hemisphere.

The question, where did the tumor take origin, is not so easily answered, although it seems probable that it is a brain tumor proper. Headache and vomiting were the earliest symptoms; the fact that the tumor was almost entirely surrounded by brain substance, save where it was adherent to the roof of the orbit, and that it had penetrated but little into the orbit are strong points in favor of such an assumption. The fact that it had perforated the base of the skull and led to a fatal hæmorrhage suggests that it may have started from the periosteum, the diploë, or the dura. But then these growths have rather a tendency to external perforation. The case was under observation four years, showing the relative benignancy of giant-cell sarcomata.

TRANSACTIONS OF THE SECTION ON GENERAL SURGERY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA.

Stated Meeting, February 14, 1896.

Dr. J. William White in the Chair.

SHOULD THE APPENDIX BE REMOVED IN EVERY CASE OF APPENDICULAR ABSCESS?

Dr. J. William White read a paper with the above title, which in substance is given in the editorial article on page 759.

Dr. Charles McBurney said that it was interesting to any one who had watched the conception and development of this nineteenth century crusade against the appendix to see how the little band of pioneers who, a few years ago, were so laboriously working against considerable opposition, had gradually increased, until the army which was attacking the appendix might be safely numbered by many thousands in this country alone. Three or four years ago he used, not unfrequently, to be honored by being called to towns adjacent to New York to do an operation on the appendix. He did not have to go more than once to each town, as he always found that after his first visit the local practitioner did all the operations for appendicitis. He had noticed also—certainly in New York—that the enthusiastic gynæcologist, whose battle-field is already reaching the neck, had long since included in his hospitable specialty the little appendix. This, and other signs, would seem to suggest that the difficulties in operations upon the appendix, and in the treatment of cases of appendicitis, had some time ago been settled, and that complete knowledge of the subject had become common property. But many important questions in regard to appendicitis are not yet settled.

One may meet with two cases of abscesses arising in the appen-

dix which differ very much from one another as regards their management. The kind of abscess which had been especially referred to by Dr. White was the abscess which had already approached the anterior abdominal wall, and in which operation by incision and evacuation without opening the general peritoneal cavity could be done. In such cases all the deep manipulations are made from the inside of the abscess cavity. The abscess which has already reached the anterior abdominal wall represents the class of cases which Willard Parker treated by his originally designed incision. An incision is made in the abdominal wall, sometimes not without difficulty, but still the abscess is opened without opening the general peritoneal cavity. In handling the interior of such an abscess, if the wall of adhesions is broken through, it is quite easy for a coil of intestine, which is not infected, to enter the abscess cavity through the opening made, at once become infected, and as rapidly disappear and reach a situation where it is entirely beyond control; or if such an accidental break in the wall of the abscess having been made, a small quantity of the abscess contents should escape among the uninfected intestines, fatal infection may be the result. The question is, then, shall we practise any manipulation, such as the removal of the appendix, when it forms an integral part of such abscess wall, which would render us liable to produce infection of non-involved peritoneum? To this question one may answer, most positively, No!

The other class of abscess should not be overlooked. There are numerous cases in which the abscess has not approached the anterior abdominal wall, the pus and the appendix being surrounded by coils of intestine, and the whole mass lying quite free in the general abdominal cavity. In operating upon such a case one first deliberately opens the general peritoneal cavity. Then with proper gauze or sponge packings the whole involved area of coils of intestine can be walled off from the other viscera, and the mass which encloses the appendix can be unravelled. The entire infected region is in this way kept under control. The appendix can be removed, every portion of intestine which has been handled, or which has come in contact with pus, can be thoroughly cleansed, and the non-infected portion of peritoneum will have been excluded from the field of operation during the entire procedure. The management of these two classes of cases should then be quite different.

He would differ also from the statement that it may be too early for interference in late cases and too late for interference in early

cases. With certain rare exceptions, where there are special contra-indications to *any* operation, he looked upon every case of suppurative disease of the appendix as being already ripe for an operation as soon as the diagnosis had been made. He would never wait two or three days for an abscess to make its approach towards a particular region before he would attempt to open it. While one is waiting, serious accidents might happen. Nor did he agree at all with Treves in the statement that very few cases require operation before the fifth day, and that the longer one waits the nearer the abscess will come to the anterior abdominal wall. It is much better to carefully and deliberately approach the abscess than to wait for the abscess to come to the point.

Each individual case should be dealt with according to the conditions present. If the abscess be three days old, it should be handled in one way; if it is ten days old, it must be managed in another way. In one case the appendix should be left alone, because it would be dangerous to take it out; in another it should be taken out, because it can be done without additional risk to the patient, and it is always desirable to get rid of the appendix if it can be removed without increasing the danger.

It had been claimed that if the appendix is not removed there is great danger of the formation of fæcal fistula. He thought the danger referred to had been much exaggerated. It was true that if the appendix remained after an abscess had been opened there were some chances that the remnant of appendix would give rise to future trouble; but, so far as his experience had gone with such cases, he had never seen a critical condition to arise from this cause. He had met with a number of cases of fæcal fistulæ, and in a number of patients he had by a secondary operation removed the appendix. Every one of these patients had eventually recovered.

When the appendix is left behind, it is in the large majority of cases destroyed in the healing process or completely obliterated. A fistula may remain connecting with the appendix, and discharging through the abdominal wall a minute quantity of fæcal material or a small amount of mucus, which is quite easily recognized as the normal secretion of the appendix under certain conditions. If there is no necessity for hastening the secondary operation, one may wait for a few months, make a fresh incision, open the peritoneal cavity, and the adhesions, which were formerly so abundant, will be found to have quite disappeared, the appendix frequently being discovered

clean, uninflamed, and connecting with the anterior abdominal wall by a small opening. The complete removal of the appendix at such a time is comparatively easy and free from danger.

Although almost all the serious obstacles to complete and safe operation in cases of appendicitis depend upon the delay in operation, he, however, was not one of those who believed in operating upon all cases of appendicitis the moment the diagnosis of the disease was made. What we most need now is to concentrate our attention in making the differential diagnosis between the various classes of cases and in more accurately determining the exact stage which the pathological lesion has reached. Every case should be subjected to operation as soon as it can be determined with a reasonable degree of certainty that the pathological process in that particular case is one which is progressive and is not likely to yield to non-operative methods. As soon as that question has been determined there can only be disadvantage in delaying interference.

The cases operated upon in the early stages—that is, within two, three, and four days—present, as a rule, no serious difficulty to the surgeon of moderate experience. At such stage the appendix is readily found, can readily be taken away, and the complete character of the operation that can then be done is most satisfactory. What is most needed, then, is to cultivate the ability to select at the earliest possible moment the cases that eventually will require operation, in order that they may be operated upon at once, when serious difficulties do not exist. An exception being made in such cases as present some special contrary indication, such as old age or severe shock, or serious concurrent disease.

As to the recurrent cases. Some individuals have one attack of appendicitis, which is followed without operation by complete and permanent recovery. Such cases are certainly better off than if they had been operated upon; but the large majority of patients who have had one attack of appendicitis, from which they have apparently recovered, subsequently present sufficiently well-marked symptoms of continuous disease, discernible upon careful examination, to justify operation in the interval and without incurring the risks of much delay. Certainly cases that have had two well-defined attacks of appendicitis, from which they have temporarily recovered, and where no special contrary indication to operation exists, had much better be operated upon without waiting for the third attack; nor can there be any propriety in allowing a patient to have numerous attacks without relief,

and in drawing the conclusion that the greater the number of attacks recovered from the greater the likelihood that a subsequent attack will be harmless. It had already been shown that the mortality from operations performed by competent operators between the atracks is exceedingly small, and that numerous cases who have successfully emerged from five or six comparatively mild seizures have on the next occasion become fatally ill. It should be remembered, too, that, as a rule, the more numerous the attacks the more difficult is the operation likely to be, because the peritoneal surface involved will generally be larger and the adhesions formed denser and more numerous.

DR. O. H. ALLIS asked (1) whether he, Dr. McBurney, thought injury has been done by too thorough palpation of an appendical abscess,—with view to a diagnosis,—and whether an examination of such a patient by a corps of surgeons may not be prejudicial to his best interests?

(2) Was the transportation of a person with a large appendical abscess to a hospital a judicious procedure?

(3) To what extent should irrigation be practised after evacuating an appendical abscess?

(4) Do fæcal fistula follow the non-removal of the appendix any more frequently than after its removal.

DR. MCBURNEY replied that, in his judgment, the amount of manipulation that is necessary to make a complete diagnosis should be of the very lightest possible kind. Anything more than very light manipulation in one of these cases must be accompanied by a certain amount of danger, one that cannot be estimated, of course, until the abdomen is opened, because we do not know how thick the barrier between abscess cavity and peritoneum.

In regard to transportation he did not think that there need be any difficulty in transporting the patient, provided that those who carry him keep him in a recumbent posture, and do not allow him to be doubled up. In this position there is little or no tax upon the abscess wall. We should have to balance against possible danger of transportation what might be very great advantages to be gained by transferring the patient to a proper place for operation.

In regard to irrigation, he thought one should be extremely cautious. Supposing an abscess has been opened without opening the general peritoneal cavity, one should be extremely cautious about using any force in irrigating. If the opening is wide, so that the return of

fluid is easy, one may certainly irrigate without doing any harm. He did not think much good would follow its use. The essential point is reached when the pus cavity is freely opened and evacuated. One cannot render such a cavity really aseptic by irrigating. Merely throwing in a little more or less bichloride solution will not accomplish good. Capillary drainage obtained by free gauze packings should be the chief reliance. Irrigation may do harm, certainly if the opening is small and much pressure is brought to bear upon the wall of the abscess.

He knew of no valuable statistics in regard to fæcal fistula. He thought the chief cause of fæcal fistula is a septic condition of wound. Careful operative work with proper precautions will rarely be followed by fæcal fistula.

DR. BARTON said that as far as his limited experience went, he fully agreed with Dr. White's conclusions. His percentage of returns after simply opening the abscess was about the same as those Dr. White quoted, out of over twenty cases operated on in this manner two had a return of the disease, one three years after the first operation and one a year after. On carefully examining these appendices after their removal at the second operation, there was nothing found to explain why they again became liable to inflammation, or why the obstruction which must have existed at the first attack had disappeared. They were both of full length and the focus of inflammation at the second attack was near the extremity, it was easily determined as they were operated on early. In one there appeared to be valvular folds of mucous membrane which might have completely obstructed at the first attack, and yet, after recovery, would not prevent irritants from again entering.

In cases of appendical abscess in which the pus instead of approaching the surface burrows into the pelvis, and where, after many ounces have been removed, the abscess walls are still out of reach of the finger, and in which it is impossible to surround the territory with gauze, he did not think it well to extensively separate adhesions in searching for the appendix.

As to the effect of gauze packing in producing extensive, permanent, and perhaps dangerous adhesions, in one of his cases which returned and was operated on a second time the adhesions were trifling, though a large piece of gauze had been overlooked at the primary operation, and had remained in the cavity twenty-two days.

FRACTURE DISLOCATION OF SHOULDER REDUCED BY McBURNEY'S HOOK-TRACTION METHOD.

DR. THOMAS S. K. MORTON reported a case which he had under care in December, 1895. A man, aged seventy-four years, of large frame and well preserved, was thrown from a trolley-car, striking upon his left shoulder, and was subsequently immediately admitted to the Pennsylvania Hospital. There the resident surgeon diagnosed dislocation of the head of the humerus and attempted reduction. Almost at once a snap was heared and evidences of fracture of the humeral neck presented. Dr. Morton was then summoned and found the head of the bone tightly wedged beneath the clavicle and almost complete paralysis of motion and sensation throughout the extremity. It was impossible to move in the least degree the head of the bone by external force. The man being apparently permanently disabled by the injury and probably destined to be a great sufferer from pressure symptoms incident to the head of the humerus resting upon the brachial plexus, and, furthermore, being in excellent condition for anæsthesia and operation, the latter was decided upon, with the idea of drawing the fragment into position by means of the hook-traction described by Dr. Charles McBurney (ANNALS OF SURGERY, Vol. XIX, 1894, p. 19), or, this failing, to excise it. Accordingly a hook similar to that of McBurney was improvised and anæsthesia by the ether-oxygen method induced. The deltoid was vertically split upon the outer aspect of the joint and the shaft of the humerus well exposed. It was then ascertained that a comminuted fracture existed. A number of small fragments laid externally while a long spicule, connected with the inner aspect of the head, ran downward in the axilla for two inches and a half. This could not be adequately exposed until a portion of the pectoralis major and the long head of the biceps muscles had been divided. Then a hole was drilled in the fragment and the end of the hook placed in it. But as soon as traction was made upon it, the bone, which was exceedingly soft and evidently the subject of fatty degeneration, gave way and the hook pulled out. Another hole was drilled at a point three-quarters of an inch below the head and traction again made. By very greatly increasing the traction-force the head left its position beneath the clavicle and came to the edge of the glenoid cavity, here the hook again tore out bringing away a considerable portion of the long, sharp spicule of shaft. But finger-pressure now easily directed the bone into the glenoid

cavity. Silver-wire sutures were employed to hold the head and shaft to proper position, all loose fragments removed, a large drainage-tube introduced, and an aseptic dressing applied after suturing the skin margins. He reacted well and so remained, save for some weakness. Nevertheless the patient ate very heartily and did excellently until the eighth day. He was then permitted to sit up in a chair, but had not been out of bed more than a few moments when he went into a sudden collapse, from which it proved impossible to arouse him, and death ensued in a very short time. The wound had been dressed, found in perfect condition, and the tube removed on the second day. No general post mortem could be obtained, but an examination of the wound after death found it to be in perfectly satisfactory condition, with no evidence whatever of infection or other complication.

Dr. Morton was unable to state definitely, but inclined to the belief that the resident surgeon had not produced an original fracture, but had simply separated the already broken and impacted bone.

NERVE-SUTURE AND REGENERATION.

Dr. Thomas S. K. Morton presented a man, aged thirty-four years, who was admitted to the Pennsylvania Hospital, August 10, 1895. His left arm had been caught between a revolving wheel and its belt. An extensive crush and laceration had resulted. There was a wound of the inner aspect of the arm running from elbow to just below the axilla. The biceps was almost cut through, so also the triceps and brachialis anticus. The brachial artery was torn, the ulnar nerve cut across, and about two and a half inches of the median nerve stretched tightly across the wound free of all support save its sheath. A large chip of bone was bitten out of the inner aspect of the humerus. The main wound connected with a smaller one on the outer side of the arm. There were also several smaller wounds about the larger ones, and the whole extremity from axilla to nearly the wrist was much contused and "brush-burned." The arm below the wounds was perfectly cold and white, and possessed no sensation except of the feeblest character in the median distribution. There was no radial or ulnar pulse.

Amputation was advised, but peremptorily rejected by the man and his relatives. Therefore, under ether, the wound was cleansed of considerable machine-oil and other foreign bodies; ends of frayed muscles and skin dissected away; the upper and lower ends of the brachial artery sought for and ligated; the torn muscles partially

approximated by catgut sutures; the ulnar nerve carefully sutured with the same material; the whole cavity sponged out with 1 : 2000 bichloride solution and then gently stuffed with iodoform gauze. No attempt was made to suture the cutaneous wounds. The arm was then done up in a copious gauze dressing wrung out of hot sublimate solution and placed under irrigation of the same in a position of slight flexion at the patient's side, while cotton batting and hot-water bags were kept constantly applied to the forearm and hand.

On August 12 the forearm had warmed up, and on the day following irrigation was suspended. On the 19th a feeble radial pulse could be distinguished and sensation in the ulnar distribution was fair. Wound had begun to rapidly fill with granulations. The exposed sheath of the median nerve had become covered with a mass of red granulations starting from its emergence from the tissues above and below the exposed portions. These increased in bulk to half an inch in diameter and ultimately blended with those arising from the deeper portions to the height of the nerve-bridge across the chasm of the wound.

Improvement continued uninterruptedly, and towards the end of September the wound finally closed. The cicatrix, while very large, does not at the present time interfere with free flexion and extension of the arm, although at one point attached to bone. The biceps and triceps are fairly strong and increasing in power. Sensation in the median distribution is perfect, and in the ulnar almost so and still improving.

EDITORIAL ARTICLES.

SHOULD THE APPENDIX BE REMOVED IN EVERY CASE OF APPENDICULAR ABSCESS?

EVERY surgeon who has had much experience in operating upon cases of appendicitis must have become practically familiar with the many interesting and important points which still admit of legitimate differences of opinion and require further investigation and experience for final settlement. These have been recently summarized as follows:[1] The true mortality of early and prompt operation in all cases in which appendicitis is present (as distinguished from cases in which it is only diagnosticated); the true mortality of the operation of removing the chronically-diseased appendix between acute attacks (as distinguished from the mortality of removal of the normal appendix); the actual percentage of ventral hernias, peritoneal bands, and other annoying sequelæ; the existence or non-existence of "catarrhal" appendicitis and of "stercoral typhlitis;" the alleged essentially infective character of all cases of appendix inflammation; the proportion of second attacks after one mild one, and the proportion of those which may be avoided by dietetics; the value of the appendix bacteriology so often relied on to demonstrate the abnormality of appendices removed by operation; endless minor differences as to the site and character of the wound, the treatment of the stump of the appendix, and other details of technique, etc. All these are not only problems awaiting solution, but questions many of which obviously have two sides, each worthy of respectful consideration. In regard to some of them it may be said that to the surgical mind having the very least judicial quality a final conclusion satisfying in every respect is to-day logically impossible.

[1] University Medical Magazine, April 16, 1896.

But there are other points as to which surgeons who combine experience with good judgment are equally well agreed. Probably few, if any, would dissent from the following rules: Immediate operation is indicated whenever the onset of a case of appendicitis is marked by both suddenness and severity; whenever, during even a mild attack, the symptoms at the end of forty-eight hours are unrelieved or are growing worse; whenever, in cases seen later, a firm, slowly-forming, well-defined mass is to be felt in the right iliac fossa; whenever at any time a sudden increase in the acuteness of the pain and a rapid diffusion of tenderness occur; whenever there is good reason for believing the appendix infection to be tubercular in character; whenever attacks of any type have been numerous, or are increasing in either number or gravity, or have unfitted the patient for work or activity, or have caused local symptoms which are permanent and persistent, or have at any time put the patient's life in great danger.

These indications for operations are practically undisputed. The list would certainly be added to by some surgeons. It is not exhaustive, but merely illustrates the fact that upon many exceedingly important points the practitioners and the teachers of surgery, the men to whom the profession has a right to look for calm, unprejudiced, and unselfish guidance on surgical questions, are of one mind.

Other questions there are as to which the same assertion does not apply, and one of these has always been a source of grave anxiety to many of the best operators in this country. It relates to the proper treatment of cases seen from the third to the sixth day, which present indications of the beginning circumscription of the disease by adhesions, and which tend to the formation of localized abscesses. Is immediate operation, with the risk of infecting the general peritoneal cavity, or later operation when the circumscribing wall is stronger and less likely to be broken through, to be preferred? This is the time which Richardson described as "too late for the early operation and too early for a safe late operation;" and he has emphasized this opinion by adding that "there is no more difficult operation in sur-

gery than that of removing an appendix at this stage without infecting the general peritoneal cavity."

The very fact that this problem has received careful and anxious consideration on the part of many able men presupposes that there must be some cases in which it is wise to respect surgically the barrier against infection set up by inflammatory adhesions, and, if this be true, that in a certain proportion of them, the appendix forming an integral part of that barrier, it is also wise to allow it to remain undisturbed.

The opposing views in regard to this important point are represented by the following quotations: "If there is a circumscribed abscess, it is poor surgery to insist in every case and at every period upon finding and taking away the appendix in the face of all obstacles. In many cases of circumscribed abscess, and especially in those in which the appendix is bound down by adhesions in the depth of the wound, the surgeon should be content with evacuation, irrigation, drainage, and packing with iodoform gauze. Persistent search for the appendix and attempts at its removal in these cases are attended with such danger of opening the peritoneal cavity that they are not to be recommended."[1]

"In operating upon pus cases in which the appendix is involved in the wall of the abscess cavity, I believe that it is possible and always advisable to make the operation a complete one, as in no other way is recovery assured. To leave an appendix which has sloughed off, or has a perforation in it, or which has been intensely inflamed by migration of micro-organisms through its walls, with the certainty of fæcal fistula or subsequent attacks, I believe to be bad surgery. It is my practice to remove the appendix in all cases. Certain it is that by the proper disposition of gauze and careful attention to technique, an appendix which is deeply embedded in a wall of lymph, whether it makes a portion of the abscess cavity or not, can be removed, and the dangers which attend its removal are far less than those which occur when it is allowed to remain. A practice

[1] American Text-Book of Surgery, 2d Edition.

which I believe is a frequent one is simply to evacuate the collection, there being no attempt made to remove the appendix if it be not plainly visible. This I consider, with all due deference to the surgeons who practise it, incomplete surgery." [1]

In reply to the assertions contained in the latter quotation, and in support of the position defined in the former, it may be said, in the first place, that the assumption that to leave an appendix which has sloughed or become perforated or has been the subject of infectious inflammation means the "certainty" of fæcal fistula or of subsequent attacks of appendicitis is positively contradicted by the experience of the profession. Nor is it possible that a deeply-embedded appendix, "whether it makes a portion of the abscess cavity (*sic*) or not," can be removed "in all cases" with less danger than ensues from allowing it to remain. As to both of these points ample contradiction is to be found in current surgical literature.

Treves, one of the earliest and boldest of the operators upon the appendix, says, "The wisdom of doing no more than is necessary, or as little as is obvious, is well illustrated in these cases. A clump of adherent intestines will often cover and protect a perforation, and the ubiquitous lymph will many times close such an opening with more speed and security than are provided by any system of suturing. As the surgeon, therefore, reaches what appears to be the starting-point of the peritonitis, he must proceed with the utmost caution, and be not only prepared, but rather inclined, to leave the actual *fons et origo mali* undemonstrated. The main purpose of the operation is to allow a noxious exudation to escape, and, if possible, to free the peritoneum of the cause of its trouble. In the class of cases now under discussion, a perforation will be very often the starting-point of the peritonitis; the lapse of time and the plastic character of the inflammation afford evidence that the perforation is, for the time being, closed. If the operator can rid the serous cavity of the effects of the perforation, he may very often leave the breach itself to be dealt with by natural means."

[1] Medical News, December 2, 1895.

Of seventeen cases in which Fowler did not remove the appendix, and which recovered, there was recurrence in only two within the next two years. The remainder had gone for variable periods, three of them for between three and four years, without any symptoms.

Richardson, in reporting 181 cases, says, "If for no other reason, the low mortality in cases of circumscribed abscess, and the perfectly satisfactory permanent results that have followed simple incision and drainage are sufficient grounds for limiting our operation to the cavity itself," and adds, "I think all will agree with me that cases of abscess should be opened and drained. Most surgeons believe that in cases of localized peritonitis no attempt should be made to separate the adhesions for the simple purpose of removing the appendix. I have no doubt whatever, from my own experience and from what I have seen of the work of my colleagues, that it is extremely dangerous to break down the barriers between an appendicular abscess and the rest of the peritoneal cavity. It is impossible in many instances, even with the greatest care, to avoid infecting the general peritoneal cavity." Of forty cases reported in his table in which the appendix was not removed, recovery took place in every instance, and he says that all fæcal fistulæ ultimately healed, and that there was subsequent trouble in only two instances.

The question was recently submitted by the writer to Drs. McBurney and Bull, of New York; Senn, of Chicago; Halsted, of Baltimore, and (to be certain that with increased experience his opinion had not changed) Richardson, of Boston.

Dr. McBurney said, "There are certainly some cases, not few in number, in which the appendix is so deeply embedded in the wall of the abscess, or so difficult to define at all, that to insist upon its discovery and complete removal would be to incur quite unjustifiable risk. One would wish always to be assured when the operation is over that the appendix had been completely removed and its proximal end properly secured. The accomplishment of this desirable result may, however, in some cases be accompanied by such great prolongation of the operation under unfavorable conditions, and by such great

danger of seriously infecting fresh peritoneal surface, that one had better be content with properly evacuating, cleansing, and packing the cavity, leaving the appendix or its remnant to be disposed of by its obliteration in the wound-healing, or by its removal at a later and more favorable time through a second operation. It should not be forgotten that the appendix is not infrequently entirely destroyed by the suppurating process before operation has been done at all. If, in such cases, indefinitely prolonged search were to be made for the appendix, a fatal result would be inevitable, and even the post-mortem examination would fail to reveal its presence."

Dr. Bull said, "I do not agree with the statement that it is 'always advisable to make the operation a complete one' in the class of cases referred to. It has been my practice to carefully evacuate and cleanse by dry sponging with sterilized or iodoform gauze the pus-cavity, then to disinfect its walls with a bichloride solution, 1 : 5000, and then to search for and remove the appendix in case it be readily found and easily separated from the adhesions. In general, I have found this feasible in cases operated on up to the seventh or tenth day. In cases operated on at a later date, or those where the abscess is distinctly circumscribed with firm walls and containing several ounces of pus, I have not attempted to remove the appendix. In many of those last mentioned it is found as a slough of the mucous membrane and in the pus. Nature has cast it off, and there is no certainty of fæcal fistulæ nor subsequent attack. The plan of always looking for the appendix is fraught with the risk of infecting the healthy peritoneum beyond the barrier of adhesions,—an immediate danger; the plan of leaving it under the circumstances mentioned exposes only a small proportion of patients to risk of subsequent attack or fistula, both remote dangers which can be met by secondary operations."

Dr. Senn said, "It has been my habit for years in cases of acute appendicitis with extensive suppuration to simply incise, disinfect, and drain the abscess, unless the diseased appendix could be removed without any additional risk. I have seen a number of such cases recover permanently without any additional surgical interference. I

regard persistent search for the appendix in such cases hazardous, as it often results in opening into the free peritoneal cavity and fatal septic peritonitis."

Dr. Halsted said, "You ask me if I remove the appendix in every case of appendicitis. I do not. If there is only one abscess, and it can be evacuated without entering the uninvolved part of the peritoneal cavity, I almost invariably treat it simply by incision and drainage."

Dr. Richardson said, "I have no doubt whatever that many cases which under conservative methods would recover are converted into cases of fatal general peritonitis by removing the appendix when it forms part of the wall of an abscess cavity. We are very apt to think in such cases that the peritonitis pre-existed,—preceded the operation. I do not believe that this is the case; I am fully convinced that many cases that are reported as cases of hopeless general infection are made hopeless and general by the rash methods frequently advocated to-day. In a localized abscess, especially if it has been going on a week or two, and the walls are firm, separation of adhesions, in my judgment and experience, is inadvisable,—more than inadvisable,—it is entirely unjustifiable. In a very large number of cases I can recall but two or three in which simple evacuation and drainage without removal of the appendix have not been followed by a cure thus far permanent. The ideal method of treating these cases is to tide the patient over the existing emergency by simple drainage, and, after permanent recovery has taken place, to remove the appendix. At the same time, the scar, which in cases of drainage always threatens a ventral hernia, should be excised, and the wound tightly closed. Such a secondary operation is always advisable in ventral hernias; it is imperative if the slightest evidence of recurring trouble exists. I cannot understand the position of those who are willing to expose patients to the dangers of general infection—as they must of necessity expose them—in breaking down the barriers of a localized peritonitis."

It would be useless to submit further evidence. The foregoing

is in accord with both clinical experience and surgical principles. Every medical man knows of the inflammatory obliteration of mucous channels; of the retrograde metamorphosis and disappearance of infected sloughs, or of their fibroid transformation into cicatricial tissue; of the shutting in of abscess cavities with infected walls, and of the coincident death of the bacteria therein as the supply of pabulum is cut off; of the spontaneous healing of fæcal fistula. On the other hand, most surgeons of to-day have knowledge of cases in which patients with almost purely local symptoms, in excellent general condition, and with distinctly circumscribed abscess have died of general peritonitis within forty-eight hours after the removal of a deeply-embedded and adherent appendix.

It must be remembered that comparison is not to be made between such removal and purely medical or non-operative treatment.

The comparison should be drawn between the routine method of insisting upon finding and taking out the appendix "in all cases" and the really surgical plan of sacrificing non-essentials in an operation to avoid dangers threatening life; of profiting by the accumulated experience of one's co-workers; and of aiming first at the recovery of the patient and only secondarily at the performance of a theoretically "complete" operation.

If the profession at large will weigh the evidence before it as to this important point in surgical practice, there can be no doubt as to the decision which will be reached. Probably no one of us who, in his own person, had any of the above-mentioned indications for operation would refuse it; it is certain that in such event he would prefer to have the appendix removed if it were possible to do so without adding to the risks of the case. These points are not under discussion. The question which every practitioner, and especially every operator, ought to ask himself is whether it is for the best interests of his patients that he should acquiesce in or try to live up to a rule which, in the face of the foregoing evidence as to the resulting increase in mortality, asserts the possibility and the propriety of removing the appendix in all cases of appendicitis.

J. William White.

INDEX TO SURGICAL PROGRESS.

GENERAL SURGERY.

I. Contribution to the Pathogenesis of Ganglia. By DR. A. RITSCHL (Freiburg). Until recently the most widely-accepted view concerning ganglia was that they occurred from diverticula from the neighboring tendon sheaths.

Ledderhose has studied the pathogenesis of these so-called ganglia, and has been able to completely overthrow the accepted theories as to their origin. In a communication to the *deutschen Gesellschaft für Chirurgie*, XVIII Kongress, 1889, he asserted that ganglia were new cystic growths due to colloid degeneration of the connective tissue occurring usually about joints.

The ganglia begin as multilocular cysts, but change by breaking down of the partitions into unilocular cysts. Specimens were presented to the congress showing various stages in the development of ganglia.

The writer describes a multilocular colloid cyst removed from near the knee-joint of a young man. Careful microscopic examination corroborated Ledderhose's assertion that these cysts are due to degeneration of the connective tissue. The various stages of degeneration were well shown. The connective tissue was observed in various stages of mucoid degeneration. The nuclei of the cells lost their elongated form, became swollen and spherical, and finally disappeared entirely; the vessels persisted a long time, but finally underwent the various stages of obliterating endarteritis and disappeared. In this specimen there was no true endothelial lining to the cyst, but in some places there was a layer of cells about the walls. Ledderhose has observed a true endothelium in some of his cysts, but it was absent in the majority of them.

The connective tissue adjoining the cyst was apparently normal.

These cysts do not always occur near a joint. A case is reported by Stahli (*Inaugural Dissertation*, Würzburg, 1889), in which a cyst of similar character appeared over the tibia.

We are still in the dark as to the cause of these cysts. One can usually obtain a history of traumatism for those at the knee, and of over-exertion for those of the wrist. Obliterating endarteritis is always present, but this is but one link in the chain, and does not explain the original cause.—*Beiträge zur klinischen Chirurgie*, Band XIV, Heft 2, p. 557.

GEORGE R. WHITE (New York).

II. The Preparation of Chromicized Catgut. By J. F. BINNIE, C.M. (Kansas City). Most of the methods of preparation now in vogue for the preparation of chromicized gut take up too much time. Recently Binnie has adopted an old method of preparation modified in a number of details, which almost absolutely exclude the possibility of error, and render the ligature materials as free from contamination as the instruments are after boiling. The modified method is as follows:

(1) Cut the catgut into lengths of from four to eight feet. Wash in soap and water, and wind each length on a separate glass reel.

(2) Place in a large quantity of a 1 per cent. watery solution of chromic acid, and leave in this for from six to nine hours. Strain off this solution through aseptic gauze.

(3) Replace the chromic acid solution by a large quantity of sulphurous acid. After twelve hours place aseptic gauze over the mouth of the vessel, strain off the acid, and replace it by

(4) A 2-per-cent. solution of salicylic acid in commercial (not absolute) alcohol. Place this in a water bath and boil for fifteen minutes or longer. The alcohol reaches a temperature of 175° F., when the vessel in which it is contained is not closed, but in practice if a stopper is applied loosely a higher temperature may be obtained.

Alcohol, in a bottle closed by a plug of cotton, very loosely inserted, is easily raised to a temperature of 189° F. This temperature is higher than that required to sterilize virulently tuberculous milk,—viz., 184° F. (*Vide*, Sims Woodhead, *British Medical Journal*, February 1, 1896, p. 297.)

Common alcohol (80 per cent.) at a temperature of 177° F. sterilizes anthracized catgut in one hour. Common alcohol (90 per cent.) at a temperature of 172° F. does the same in three hours, while absolute alcohol at the same temperature is inert. Koch proved that 5 per cent. carbolized alcohol is useless as an antiseptic at ordinary temperatures, but Saul shows that although anthracized catgut is unaffected by boiling in a 5-per-cent. solution of carbolic acid in *absolute* alcohol, yet if 10 per cent. of water is added sterilization is attained rapidly even if the catgut is thickly covered by fat or vaseline. In Saul's tables we find it stated that 90 per cent. alcohol plus 5 per cent. of carbolic acid kills the spores of anthrax in ten minutes; on studying his experiments, however, one finds that the longest time required was seven minutes. In the preparation of ligatures for use, Saul merely exposes the *raw* catgut to the above solution for fifteen minutes after the boiling point has been reached. He makes use of a special apparatus to collect and return the evaporated alcohol so as to prevent a too great concentration.

In view of these experiments of Saul, it might, perhaps, be advisable to substitute for the salicylated alcohol carbolized, 90 per cent. alcohol.

To have the ligatures in a convenient form for carriage, Binnie places them in small, sterilized bottles, with rubber stoppers, and pours on a sufficiency of salicylated alcohol, and lest there should have been any contamination while the change is being made from one bottle to the other, they are again boiled in the water-bath for a few minutes and the stoppers pressed home. Just before operating, the firmly-stoppered ligature bottles are immersed in a strong solution of corrosive sublimate, so that by the time they are required, not merely are the ligatures sterile, but the outside of the bottles are clean

enough to be handled by the surgeon himself, and there is no danger that the ligatures in being removed from the bottle will be contaminated by touching the outside of the glass.

The reason for cutting the ligatures into lengths of from four to eight feet is that in very many operations but one or two ligatures or sutures are required, and if each reel contains many feet of ligature one is tempted to return what is left, while, if only a small quantity of gut is on the reel, one can throw away the remnant and so avoid chances of accidental contamination. If long ligatures are wound on ordinary glass reels there will be so many layers superimposed, one on the other, that the chemical solutions may not get into the deeper layers. This is another point in favor of the short lengths of ligature advised.

The use of small bottles to contain the ligature is convenient because, in the course of an operation, one may accidentally contaminate the contents of one bottle and yet have plenty left in proper condition.

If small bottles are used for carriage because of their convenience, they should not be used in the original processes, because they do not contain enough of the chromic acid solution or of the sulphurous acid in proportion to the quantity of catgut to be acted upon.

A special feature of this method of preparation is that from beginning to end of the process of sterilization the ligatures are untouched by the fingers, and forceps are only used once,—viz., to transfer the reels from the large receptacle to the small bottles; thus many chances of accidental contamination are avoided. Catgut, which has been soaked in a one-per-cent. watery solution of chromic acid for nine hours remains unabsorbed at the end of three weeks. When less resistant gut is desired, one merely lessens the time of exposure to the action of chromic acid.—*Kansas City Medical Index*, June, 1896.

REVIEWS OF BOOKS.

TRAITÉ DE CHIRURGIE CÉRÉBRALE. PAR A. BROCA, Chirurgien des Hôpitaux de Paris; Professeur agrégé à la Faculté de médecine; Membre de la Société de Chirurgie; et P. MAUBRAC, ancien prosecteur à la Faculté de médecine de Bordeaux. 1 Vol. in 8vo avec 72 Figures dans le texte.

TREATISE ON CEREBRAL SURGERY. By PROFESSOR A. BROCA and DR. P. MAUBRAC.

The growing interest in brain surgery is shown not only by the numerous articles upon this subject which appear in the medical journals, but also by the publication of monographs and formal treatises of which the present one is the latest. Professor Broca has been known as one of the few surgeons in France who have taken an active interest in this subject, and the record of his operations in this book numbers thirty-one. The work opens with a chapter upon the "Anatomy of the Convolutions of the Brain," which is followed by a chapter upon the topography of the various functional areas as related to the skull. These chapters are very carefully prepared, and give a *résumé* of all the various methods proposed for determining the relations between the surface of the head and the convolutions of the brain. The third chapter presents in clear form the facts of localization upon which are based the diagnosis of local lesions, and this is followed by a chapter upon the operative technique and its dangers. The authors seem to prefer the trephine to the chisel in opening the skull.

The second part of the book is devoted to a study of the various diseases in which operative interference is warranted. These are taken in the following order: The traumatic lesions, primary and second-

ary; the intracranial complications of otitis media, meningitis, phlebitis of the sinuses and abscess; intracranial tumors; hæmorrhages and meningitis; hydrocephalus; microcephalus and various functional troubles, including epilepsy, psychoses, and headache; encephalocele. Each of these subjects is discussed with great care and thoroughness, and all the facts at present accessible are put clearly before the reader.

The book is to be especially commended for its full references to modern literature, including both English and American authors, which are usually entirely neglected by the French writers. The references alone demonstrate how much more interest has been taken in cerebral surgery in England and America than by the continent of Europe. It is to be hoped that this work, like that of Chipault, will succeed in convincing our continental *confrères* of the utility of this form of surgical interference. The stand-point of the authors is not optimistic, and yet the propriety of surgical interference in certain cases of brain-disease is forcibly presented. The work can be highly commended to our readers, as it is a reliable presentation of the facts up to date.

M. ALLEN STARR.

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